Montana Outdoors

March/April 1977
75¢

Montana Outdoors March/April 1977 Vol. 8, No. 3

2 **Going Home**
The intriguing process by which animals return to the same seasonal ranges. by Dr. Robert Eng

7 **Saline Seep**
Without steps to control it, the problem will worsen and its various costs—including the one to the state's wildlife—will increase. by Mike Aderhold

11 **Catchall**
"Bringing the Bobcat Back," and other items

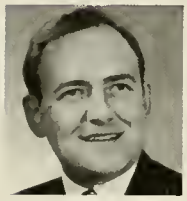
13 **Update**
New information on the Beaver Creek South court decision and what happens when 2,4,5-T spreads throughout the countryside—in Seveso, Italy

15 **Wildlife and Law Enforcement**
Adequate regulation and enforcement contribute to successful wildlife programs. by Mel Wojcik

18 **Bats Need Friends, Too**
More people need to understand the fascinating role these creatures play in nature. by Dennis Flath

23 **Dear F&G**
Sweet Grass County Attorney objects to article

27 **Placing American Wildlife Management in Perspective**
Wildlife has many helping hands. A reprint from the Wildlife Management Institute, with illustrations by Oscar Warbach



Thomas L. Judge/*Governor, State of Montana*

Joseph J. Klabunde/*Chairman, Fish and Game Commission*

Commission Members:
Arthur C. Hagenston
Spencer S. Hegstad
Land Lindbergh

Dept. of Fish and Game
Robert F. Wambach/*Director*
Fletcher E. Newby/*Deputy Director*

James A. Posewitz/*Administrator*
Environment and Information Division

Steve Bayless/*Chief*
Information Bureau

Bill Schneider/*Editor*
Kay Ellerhoff/*Associate Editor*
Marty Beatty/*Circulation Director*
Donita Sexton/*Art Director*
Vern Craig/*Artist*
Tom Warren/*Photographer*
Craig Sharpe/*Photographer*

ASHTON'S BUTTE

THE COVER: The pintail is one of many species of wildlife that "go home" every year. See page 2 for Dr. Robert Eng's article on this interesting phenomenon. Front cover photo: Lynn Aderhold. "We all need clean water" is the slogan for this year's national wildlife week, March 20-26. Of course, this applies to wild animals, such as the brown bears pictured on the back cover, just as much as to human animals. Back cover photo courtesy of the National Wildlife Federation.

Montana Outdoors, the official publication of the Montana Dept. of Fish and Game, is published six times each year (January, March, May, July, September and November). Contributions (manuscripts or illustrations) are welcome with the understanding that the department or the editor cannot be responsible for loss or damage. All contributions will be published at the discretion of the editor. Subscription rates are $3 for one year, $5.50 for two years, $8 for three years and $2.50 for each additional year. Individual copies are available at newsstands and regional department offices. Price per copy is 75 cents. Although *Montana Outdoors* is copyrighted, permission to reprint articles is available by writing our office or phoning us at 406/449-2474. All correspondence should be addressed: *Montana Outdoors*, Dept. of Fish and Game, 1420 E. Sixth; Helena, MT 59601. ©Montana Dept. of Fish and Game. All rights reserved.

Postmaster: *Montana Outdoors* is entered as second class mail in Helena, MT 59601. Additional entry is in Butte, MT 59701.

The Director Speaks

As the new director of the Dept. of Fish and Game, I want to take this opportunity to introduce myself to the readers of *Montana Outdoors.*

I realize some folks were a little surprised when the governor selected an "outsider" to head the department; and others are wondering whether the dean of the University of Montana School of Forestry (my last job) is an appropriate choice to direct a wildlife agency. Obviously, I think I can do a good job. Otherwise, I wouldn't have accepted the appointment.

I consider my specialty to be *natural resource administration.* Also, I have many years of academic training and experience in ecology, management, resource policy and economics. I am a natural resource "generalist" with credentials that served me well in my last job, and which should be very useful in my new position.

The School of Forestry, which I administered for nearly five years, has full-fledged programs in wildlife biology, range management, water resources, outdoor recreation, resource conservation and wilderness management—in addition to forest management. The Dept. of Fish and Game which I now direct is also multifunctional, with programs in game management, fisheries, law enforcement, recreation and parks, information and environmental protection. In both cases, a generalist with administrative skills is able to serve very effectively in a leadership position.

I consider my background in economics—the field in which I earned my Ph.D.—a very valuable asset. This gives me a different philosophical slant than most people with strong biological training. I hope to make this apparent as the department makes decisions and brings them to the public with *Montana Outdoors* and other information outlets. Although the impact of a development on fish and wildlife is our first responsibility, we will try to consider the social and economic issues involved.

To put this another way, my philosophy is man-centered. Things have value only if they are needed, wanted or appreciated by man. For example, if enough people want grizzly bears badly enough, the grizzly bear becomes a valuable resource—and as the number of grizzly bears diminishes, their value increases.

My job is to make sure the Dept. of Fish and Game properly identifies the value of the resources under our jurisdiction. Then, we must take appropriate action to protect or enhance these values.

In other words, our job is to serve people. Whether people want to hunt elk, see wild songbirds or camp or picnic in proximity to pristine landscapes, we will do what we can to accommodate them.

The trouble is that different people put different values on different things. And, we can't give everybody everything all of the time. So, we have to make some choices, some trade-offs, some unpopular decisions.

I can promise that we will use our best professional judgment, our best technical skills and as much energy as we can muster to maximize the value of wildlife and outdoor recreation in Montana.

I can guarantee that the department will function vigorously as the protector and advocate of Montana's wildlife resource. I can guarantee that we will always operate in the open, with as much advice and counsel as we can possibly elicit from the public we serve. And, I can guarantee that I intend to give my strong personal support to *Montana Outdoors.* I can't take credit for its achievements to date, but from this point on I want to be regarded as one of the magazine's strongest patrons.

Robert F. Wambach

Two waterfowl species—mallard (top, photo: Jerry Manley) and blue-winged teal (F&G photo: Mike Aderhold)—that exhibit strong homing instincts.

Going Home

why wildlife returns to the same place year after year

by Dr. Robert Eng

The alert observer in the outdoors—whether hiker, hunter or fisherman—has undoubtedly noticed that an area in a particular season will consistently harbor certain birds or mammals. He has probably also noted that during other seasons this same area may have few, if any, of these same species.

This apparent "feast or famine" is often related to a seasonal habitat requirement. If the habitats required for an animal for two seasons are sufficiently different and geographically removed from one another, the animal makes annual, seasonal movements. If the annual movements are long enough, the animal is called "migratory."

All animals have what is commonly called a home range—where they reside on a year-long basis. A small mammal such as the white-footed or deer mouse may spend its entire life on a fraction of an acre and seasonal movement, if identifiable at all, would be small. On the other hand, certain elk and deer in mountain habitat move so extensively between summer and winter that detailed studies include both summer and winter home ranges. For the ultimate in seasonal movements, many birds separate summer and winter ranges by hundreds and even thousands of miles. Whether one considers a mule deer moving 15-20 miles or a pintail duck 1,500-2,000, study after study indicates that many of these mammals and birds often return to the same areas, winter and summer. This tendency by animals to return to the same seasonal ranges is called *homing.*

Researchers have studied homing in both mammals and birds, but birds have received more attention. Although the migratory species have provided the most striking information, some resident birds show some interesting comparisons.

Sage grouse, the largest North American grouse, exhibit a variety of annual movements, depending on the type of terrain they inhabit. In the sagebrush valleys of southwestern Montana and adjacent Idaho, this bird may travel 50-100 miles annually—from the low snowfall, sagebrush flats in which it winters to the moister mountain foothills during summer. Even with these extensive movements, the birds show a high degree of homing to each of the seasonal habitats. Once breeding males establish on a strutting ground, they return year after year, not only to the same display ground but often to the same 15-20 feet of ground occupied in previous years.

In central Montana (where sage grouse year-long habitat is more evenly distributed), annual movements are much less, perhaps ranging from two to six miles. Banding records from this area show a high degree of homing, not only to breeding grounds but also to wintering areas. Frequently, birds from several display grounds will be found together for five or six months on a winter range. Yet the following spring, nearly all of the males and about 75% of the females will home to the strutting ground on which they were trapped the previous year, even though they may pass by another strutting ground en route.

Because of their economic importance and popular appeal, more waterfowl (ducks, geese, swans) have been banded by researchers than most other groups of migratory birds. Consequently, more precise information exists about their homing tendencies.

continued

Varying degrees of homing to a breeding range are exhibited by different waterfowl species. Canada geese show a high rate of return to a nesting area, usually returning as a family group including young from the previous year. This habit strengthens ties between the yearling and that particular breeding area and promotes geographical isolation of certain breeding populations. These close family ties, plus the high degree of homing, probably minimize interbreeding between groups and contribute to the continued identity of the 11 or more races of the "honker" which occur across North America. These races range from the 18-pound "giant" of the prairie habitat to races breeding in the Arctic which barely exceed the size of a mallard drake.

Probably the king of "homers" in the duck world is the wood duck. This colorful, secretive species is most plentiful in the United States along the East Coast, the Mississippi Valley and parts of the West. Although not considered abundant in eastern Montana, breeding records are becoming quite common along parts of the Missouri and Yellowstone drainages. As a hole-nesting species, this bird probably has developed a high rate of homing because it needs specific nesting habitats. Studies have shown from 40%-75% of adult females trapped on the nest one year were retrapped in the same area the following year. Adjusting these observed return rates to reflect annual mortality suggests that almost all adult females home to the former nesting area.

Sage grouse annually travel from 50-100 miles between summer and winter habitat. Most birds also return to the same strutting ground to breed. photo: Harry Engels

Some hens have even been retrapped in the same nest used the preceding year. Yearling female wood ducks also show a high rate of return to the area from which they fledged, but at a lower rate than adults.

Some species of dabbling or puddle ducks such as the pintail and the blue-winged teal show considerable flexibility in homing tendencies. Dr. Lyle Sowls studied the homing rate of five species of ducks nesting in Manitoba prairies. He found adult pintails, gadwalls and shoveler females returned to nest in the same meadow at a rate above 50%, blue-winged teal at a rate of 26%-42% and mallards at only 10%-15%. Not only did these females return to the same meadow, but often nested within 50 yards of the nest used the preceding year. This was accomplished after flying to wintering areas in the southern United States or, in the case of the teal, into Mexico.

For the past few years, personnel from the Montana Dept. of Fish and Game, U.S. Bureau of Land Management and Montana State University have conducted banding studies in south Phillips County on stock ponds. Although researchers have emphasized banding members of intact duck broods, they have recaptured adult female teal who remained with the brood as it was driven into the trap. Eight banded females with broods were trapped. (The females had been banded in previous years either as hens with a brood or as ducklings.) Seven of the eight were recaptured on the same pond on which they were trapped earlier, and one on a pond about 200 yards away. Researchers trapped one as an adult female with a brood in July 1972; she was recaptured with a brood on the same pond in August 1976. Winter band returns from this teal population show a high propensity for wintering in Mexico.

Except for geese and swans which apparently pair for life, strong homing to the breeding area largely characterizes the female. In many species of ducks, a new mate is selected each year, often on the wintering grounds. Wintering areas frequently harbor ducks from widely separated breeding areas. Consequently, pairs will include ducks from different sources, making it impossible for both to home and yet remain together. Probably because the female selects the actual nest site, she leads the way. When males home to the area on which they were reared, they are usually unpaired drakes.

Research has emphasized the homing tendency which ducks exhibit for the breeding area, perhaps because information is more easily obtained at this time of year. F. C. Bellrose of the Illinois Natural History Survey reported mallards and black ducks have a strong homing tendency for areas along fall migration routes. Also, all ducks of the same species using a given route may not home to the same stopover point. So, migrating ducks home in "leapfrog" fashion along the route. Other studies have documented strong homing tendencies by Canada geese to traditional wintering grounds.

When does this homing tendency develop? For some time, researchers speculated this was a hereditary trait passed on from parent to offspring. A now classic study conducted by I. Valikangas in 1933 dispelled this notion. In this study, eggs laid by mallards in England were transported to Finland, hatched and the birds reared, marked and released. The following year, researchers recorded a high return to Finland of 55%-58%.

For a time, scientists believed the homing characteristic was tied to the location at which the bird hatched. This belief, too, has since been rejected. Several studies have been conducted where ducks have been hatched in one area, transported to and released at another, before the age at which they take flight; the birds homed to the site on which they were transplanted. One study conducted in Alberta involved 273 7- to 8-week old Canada geese transplanted appoximately 100 miles north of the lakes on which they hatched. Although many young geese were flying one week after their move, they homed the next two springs to the ponds on which they had been transplanted. It seems the homing characteristic is established at the time of first flight, when the birds orient themselves to the immediate, surrounding area.

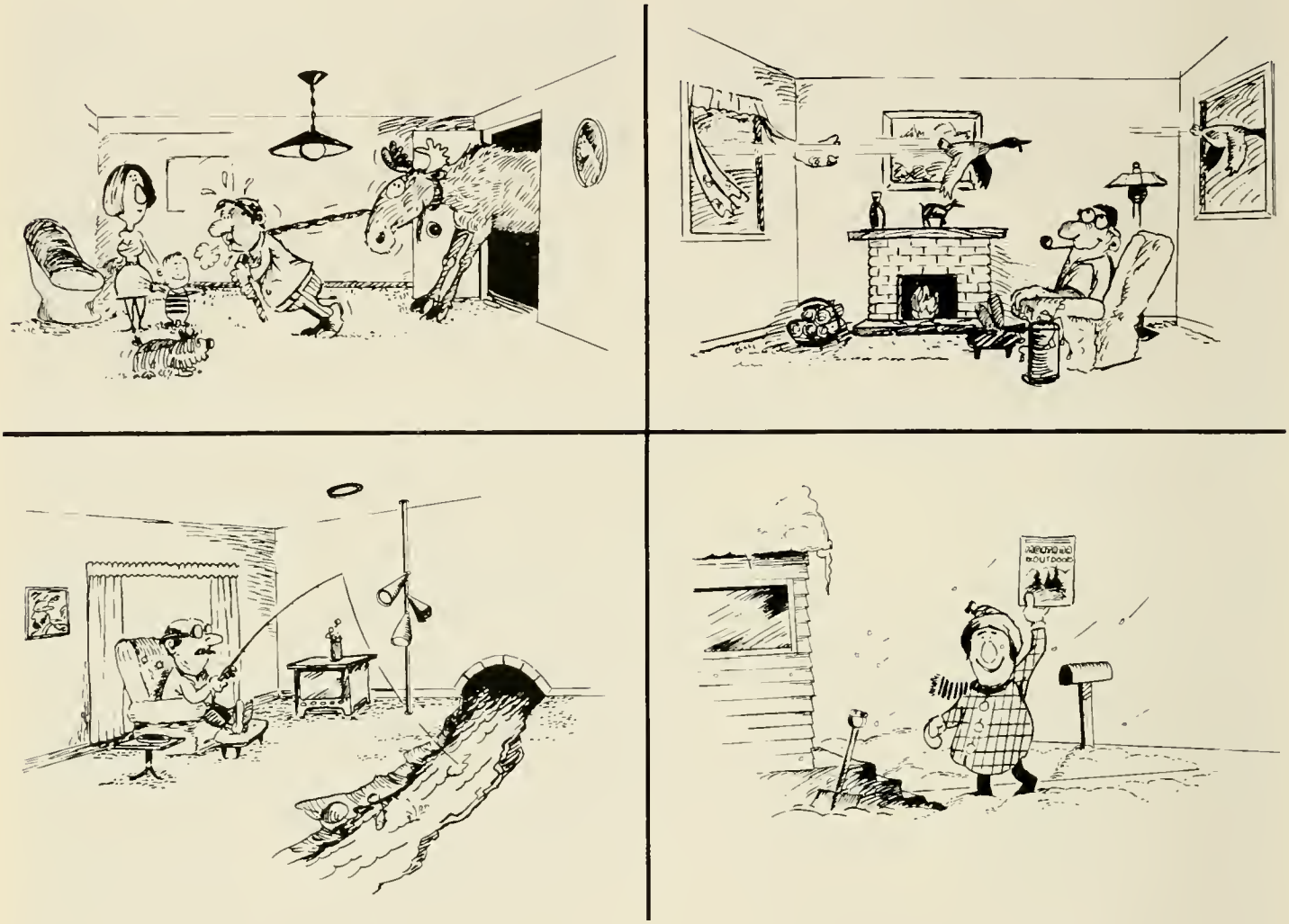
In addition to being an interesting sidelight in bird activities, the homing phenomenon has management implications. In general, birds with a high homing rate are not good pioneers; conversely, those with a lower rate or with more flexibility in homing instincts (puddle ducks, some diving ducks) will pioneer (moving of individuals of a species into a previously uninhabited area) new habitats more readily.

As mentioned earlier, Canada geese are poor pioneers. But many breeding populations have been started in new, suitable habitat by using captive flocks. These birds, kept in captivity by pinioning them or clipping their wings, produced offspring which were allowed freedom to migrate. They returned as wild, breeding birds. However, establishing and maintaining a captive flock is costly. In light of current information, a much less expensive program of trapping and transplanting wild goslings accomplishes the same goal. This approach has been used to introduce or reintroduce wood ducks, another poor pioneer, into unoccupied habitat.

Following the drought of the 1930s, thousands of reservoirs were constructed in semi-arid areas of the northern Great Plains. This created new waterfowl habitat over a large area. The first studies of duck production in these areas listed the mallard, pintail and blue-winged teal as the three major species breeding in the area; the latter two are flexible in homing ability and consequently make good pioneers.

Most of our natural resources are facing increasing demands. Additional knowledge of a species places the wildlife manager in a better position. Recent changes in waterfowl management lean toward separating segments of the population into management units, much more refined than the broad flyways traditionally used. Knowledge of homing will play an important part in these changes. ■

Four Ways to Bring MONTANA OUTDOORS Indoors



In Case you Prefer #4, Here's How to Subscribe

Name_____

Street_____

City _____ State_____ Zip_____

☐ 1 year $3.00 ☐ check enclosed ☐ new

☐ 2 years $5.50 ☐ bill me later ☐ renewal

☐ 3 years $8.00 **JA42**

Saline Seep

why we have it, how to prevent it

by Mike Aderhold

Once-productive soils reduced to weeds, a white salt cast on plowed ground, dying willows along a water course, thicker algae blooms, earlier aquatic weed growths, unexplained cattle and deer deaths near water, fish unable to reproduce or even live in former habitats, wet or soft areas showing up in well-drained fields, salty creeks that run late in the summer in dry areas, high and then low crop yields seemingly independent of the weather, domestic wells going sour, municipal wells losing quality, unexplained waterfowl deaths—all of these incidents have been reported to the Dept. of Fish and Game in the last two years. They are pieces of an interesting puzzle which, when assembled, may be related to saline seep.

Officially defined, saline seeps are *recently developed* salty soils in *nonirrigated* areas that are wet some or all of the time, often with white salt crusts and where crop or grass production is reduced or eliminated. The fact that saline seeps are recently developed separates them from alkaline soils, the "salt" flats and greasewood bottom lands described by Meriwether Lewis and William Clark (1805) and other early explorers. These alkaline areas resulted from the area's geology—poorly drained sites from which collected soil salts never drained. They are limited, stable, uproductive, historic wastelands resembling saline seeps but not created by the same forces.

The Montana Cooperative Extension Service first documented the saline seep problem in 1947. At that time, researchers estimated saline seeps were growing by 1% per year. Recent estimates during wet years place this increase at over 10% per year. Today, 34 of Montana's 56 counties have reported over 140,000 acres of agricultural land that matches the official definition of saline seep. Saline seeps are showing up in the grain fields of Saskatchewan and the Dakotas. The U.S. Dept. of Agriculture conservatively estimates that in Montana alone, 8 million acres could possibly be affected unless current trends are reversed.

To understand this problem requires a rough appreciation of northern Great Plains geology, the natural prairie and Montana's recent agricultural history. Surface soils over much of eastern Montana were formed from the sediments of large seas. This parent material contains high concentrations of soluble salts. Most of the surface material has been displaced or otherwise disturbed and it now covers relatively undisturbed, water impermeable layers of shale or clay. This is particularly true in the northern one-third of eastern Montana which experienced at least four periods of glaciation. When these huge ice formations melted, they deposited a mixed mass of material called "glacial till"—material that today supports much of Montana's grain industry.

After the last glacier retreated, primary vegetative development began again. Over thousands of seasons and millions of trials covering 15,000 years or so, a marvelously adapted vegetation evolved. Highly efficient and durable, the prairie vegetation was diverse and stable enough to withstand severe cold, blistering heat and the periodic ravages of hail, trampling, heavy grazing, prairie fire and prolonged drought.

Water was the prime limiting factor and prairie plants developed several mechanisms for using the water that did come. Prairie vegetation had a foliage surface as much as 20 times as great as the soil surface beneath it. This foliage intercepted weather and protected soil. Leaf and stem surfaces held water and the annual build-up of dead plant matter formed an absorbent organic mat that held rain water and snow melt. Surface run-off was effectively reduced.

The roots of most annual and perennial wildflowers extended between 2 and 5 feet into the soil. The roots of two-thirds of the typical climax prairie plants (the last stage in plant development, in which the plants are capable of renewing themselves indefinitely) extended beyond 5 feet, often to depths between 8 and 12 feet, with some root systems exceeding 20 feet. With branching and lateral spread, total root lengths of many individual plants could be measured in miles. Little, if any, precipitation that fell on prairie sod percolated beyond the root zone, so

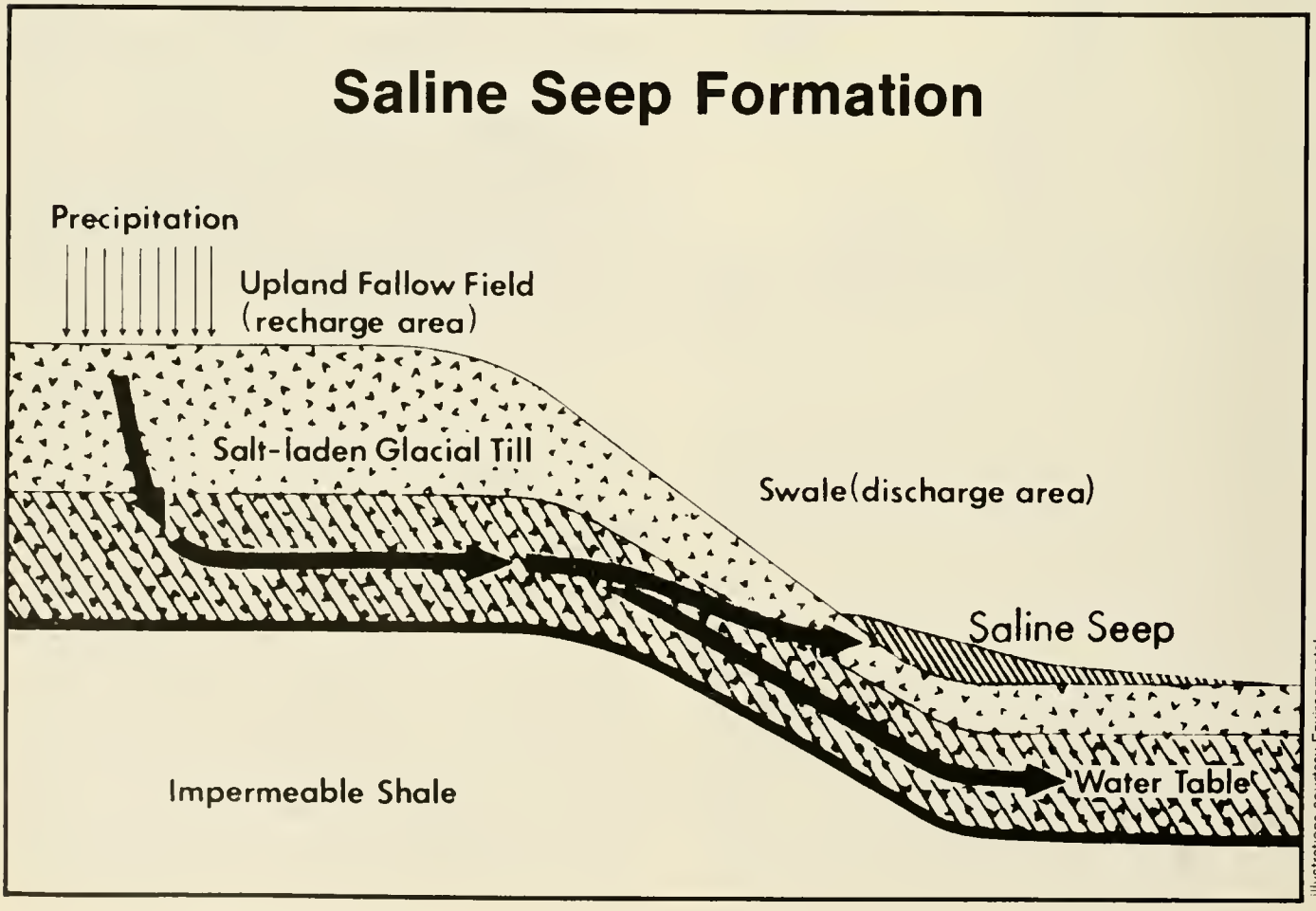
seepage downward into subsurface water tables was minimal. Lateral movement of salt-laden water was limited. As evolved, the prairie ecosystem effectively protected itself from the threat of spreading soil salts.

Homesteaders brought a significant grain industry to Montana shortly after the turn of the century. Railroads provided encouragement, a market and a route West. A series of wet years, early success and a war economy stimulated unprecedented agricultural development. The early-day "amber waves of grain" were an impressive achievement. Unfortunately, the boom died as fast as it developed. Drought, wind, heat, dust and insects littered the plains with broken dreams and farms that failed. Survivors learned to plant only the richer soils, to farm rows perpendicular to the prevailing winds, to crop alternate strips, to conserve soil moisture. Later refinements included contour cropping, stubble mulching and intercepting snow with vegetative barriers.

In the late 1940s, beginnings of the saline seep problem followed the wholesale adoption of the new summer fallow system of grain farming. In 1930, 2.7 million acres in the state was in summer fallow; in 1950, the figure was 4.2 million, and by 1964, 6.2 million acres was lying fallow. The prairie sod was replaced by a number of plants which, unlike the long developed prairie plants, could not intercept, hold or use all the water they received. The plowed, fallow areas without plants were, of course, even less able to utilize the available water. Water either moved across the soil surface to low areas, creating ponds and overloading the subsurface drainage system, or more often penetrated the soil surface, percolated down and caused a rapid build-up of the water table. These areas where precipitation and run-off water are absorbed and transferred to, and which also raise the soil's water table, are called "recharge" areas. They create or cause saline seep. These recharge areas are characterized by a failure of the plant community to use (transpire) the water in the soil.

The next important factor is the nature of the soil. The relative amounts of water soluble salts (such as the sulfates and chlorides of sodium, calcium and magnesium) and the concentration of nitrates in a soil determine the ground water's chemical composition. How deeply the impermeable shale or clay layer lies, soil particle size and the area's topography determine ground water storage and drainage. When the storage capacity is exceeded, the subsurface water—now charged with soluble salts—moves laterally to lower areas where the water eventually surfaces, creating a seep. These surfacing areas are the "discharge" or salty part of the seep system.

Saline seeps are complex entities; no two are alike. Every seep is an individual and distinctly local



illustrations courtesy Environmental Quality Council, Second Annual Report, 1973

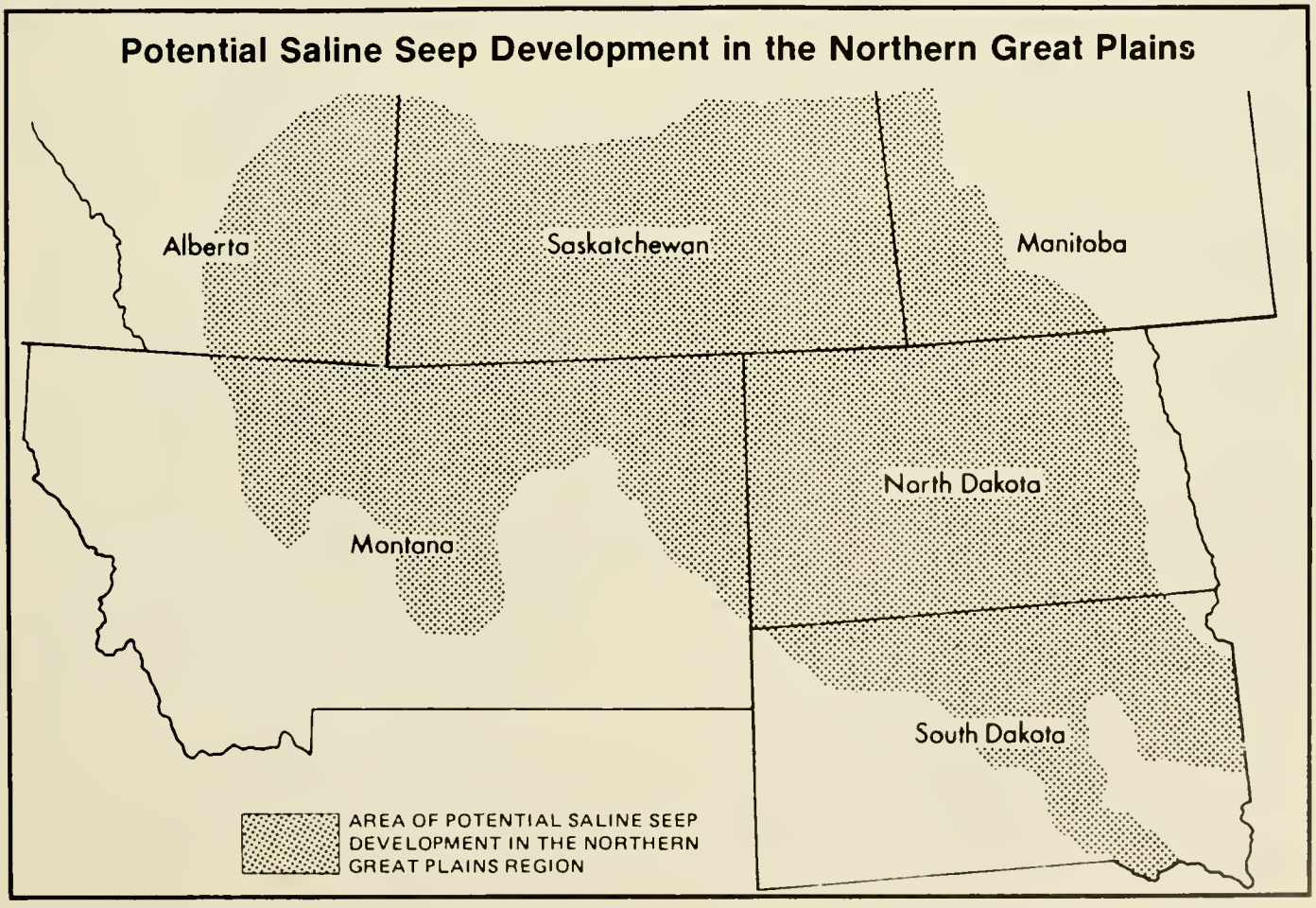
system. All seeps, however, have three symptoms in common: (1) recharge, (2) subsurface storage and movement and (3) discharge. The impact of a saline seep occurs because of the effects of the discharge.

A seep usually evolves over several years. During the first few years, the water table builds up and crop yields increase because of the additional available moisture. The farmer then notices that certain areas stay wet long after adjacent areas have dried. Since the wet ground cannot be worked and the water is saline (salty), salt-tolerant weeds invade. The sequence goes something like this: In Montana, the wasteland weed *Kochia* (often called fireweed or summer cypress) usually appears first, followed by foxtail barley. White crystals of gypsum (calcium sulfate) and Glauber's salt (sodium sulfate) appear as the salt solution comes to the surface and the water evaporates. If grain is planted at this point, the crop usually fails. Saltgrass, some mustard species, pigweed, lamb's quarter, bindweed, quack grass and Russian knapweed may begin growing on the seep. If left undisturbed long enough, the site could evolve into a salt shrub community where salt-tolerant plants thrive.

Some seeps may affect areas away from the immediate vicinity when excess water flows over nearby land. High absorption (recharge) can even cause certain seeps to flow as springs during some periods of the year. In other cases, salts are carried downstream by snow melt or rains. These run-offs are collected in stock ponds or reservoirs and the salts become concentrated during the late summer when conditions are drier. These collected salts can eventually impact open water systems.

Researchers have just begun assessing the impacts of saline seeps. Quite a bit of information, however, is available about the general effects of salinity. Soils subject to saline conditions usually flocculate or clump which increases their permeability and decreases their ability to grow plants. On the other hand, high sodium concentrations can cause the clay particles in the soil to scatter. This results in formation of crusts, and seeds won't germinate very well because water can't penetrate the soil.

Salts may also upset the soil's nutritional balance by creating concentrations of trace elements and nutrients toxic to many plants. Many plants—including most vegetables, many cereal crops, alfalfa, clover and hay—simply can't tolerate high salt concentrations. So, yield is reduced or the desired species dies. Some salts alter the alkalinity of standing water, favoring aquatic plants to such a degree that the decaying vegetation in winter uses all of the pond's oxygen. The result? The water environment cannot support fish. Alkalinity can stimulate algae so that it fouls the pond or covers the surface,



inhibiting some aquatic plants and clinging to and dragging down others. Again, the pond's dissolved oxygen is endangered. Some toxic blue-green algaes and disease-causing organisms also thrive in certain salt-water concentrations—botulism, fowl cholera, aspergillosis, tetanus, blackleg and anthrax, for example.

Highly mineralized waters create physiological problems in domestic animals, including gastrointestinal upsets, diseases where the animal "wastes" away and sometimes death. Pregnant, lactating or rapidly growing animals are particularly vulnerable to mineral imbalances. Lack of growth and failure to gain weight may result simply from the animal avoiding salt-contaminated water. Saline conditions probably also contribute to waterbelly or urolitosis (the formation of kidney or bladder stones) which causes blockage of the urinary tract. The combination of various salts, heavy metals and concentrated nutrients also creates additional problems.

Literature about effects of salinity on wildlife is increasing. On request, the Denver Library's Fish and Wildlife Reference Service sent a computer printout listing 47 recent publications from 17 different states on salt problems affecting over 70 different wildlife species. The invertebrate link in the food chains of many fish is especially sensitive to changes in salt concentrations, as are the reproductive systems of many upland birds. Some researchers suspect that salt-contaminated waters are a factor in Montana's and North Dakota's recent white-tailed deer losses. The tremendous waterfowl losses associated with periodic outbreaks of botulism definitely have been linked to salt-charged alkaline situations.

In concept, control of saline seep is quite simple: (1) eliminate the recharge of moisture or (2) eliminate the flow of salt-contaminated subsurface water to the discharge area. The hard part comes in achieving this control. The ultimate solution rests with landowners and farmers who control the various parts of the saline seep system. A number of federal, state and private agricultural agencies have researched the practical alternatives and prepared informational pamphlets. The options involve a range of trade-offs and a number of complex values. Economic values involve land cost, equipment cost, market values and the cost of losing land affected by saline seep versus the cost of control and reclamation. Political values include the questions of subsidies, allotments, land bank programs and landowner rights. Legal values encompass current federal and state pollution laws and regulations, and social questions involve the moral responsibility of a farmer to his neighbor.

The "no action" alternative, while possible, promises the least and damages the environment the most. The "action" alternatives are expensive and time consuming. Two basic approaches exist: (1) vegetative and (2) nonvegetative. The first approach manipulates the amount of water plants use in the absorption or "recharge" area. The basic idea involves using the water where it falls and emulating the native prairie's ability to prevent excess water percolation. These alternatives, beginning with the most efficient, include:

(1) re-establishing native or commercially developed grasses in the recharge area,

(2) recropping with deep-rooted perennials (alfalfa, sweet clover) in the recharge area,

(3) intensive cropping with perennial barriers in the recharge area and

(4) intensive annual cropping in the recharge area.

Nonvegetative alternatives include land leveling, cutting drainage ways and intercepting the water table before it surfaces and interrupts the land's productivity. These mechanical alternatives, beginning with the most efficient, include:

(1) artificial drainage with solar-powered desalinization (salt removal),

(2) artificial drainage with fossil-fueled desalinization,

(3) artificial drainage with evaporative lagoon disposal and

(4) artificial drainage with untreated surface disposal.

Obviously, wildlife would benefit if the spread of saline seeps were arrested. The more efficient the alternative, the more sure one could be of stopping the spread of the problem. The vegetative alternatives are preferable to the nonvegetative alternatives since the former involve less site disturbance.

Our geologic and climatic heritage and agricultural traditions guarantee the problems of saline seep will be with us for some time. Without action, the problem will worsen and the various costs—including the one to the state's wildlife—will increase. Efforts in Montana have led the way in looking into solutions. Efforts must continue to inventory areas and waters affected, to refine the solutions and to educate the public. Saline seeps occur largely because of annual precipitation on land where there are no plants to effectively utilize the moisture. During dry periods, the problem may appear arrested. But if our concerns or efforts slacken, saline seeps will continue to spread and solutions will simply be that much harder to come by.

•*This article is only a summary of a highly complex situation. Interested readers and landowners desiring more information are encouraged to contact their county extension agents or district conservationist, or write to area offices of the Montana Cooperative Extension Service, the Soil Conservation Service, or the research facilities of the U.S. Dept. of Agriculture and ask for detailed publications. To our knowledge, the most detailed summary of saline seep in Montana can be found in the Environmental Quality Council's Second Annual Report, in an article by Marvin Miller and Loren Bahls and in a later article by Michael Harlow, "Environmental Impacts of Saline Seep in Montana."*—Ed. ■

The Catchall

Bringing the Bobcat Back

For the bobcat, the call of the wild has become a cry for help.

Montana's small wildcat is in big trouble. But the 1977 Montana Legislature can keep the bobcat from becoming the missing lynx.

Like most beleaguered species, the bobcat suffers from habitat destruction. However, this isn't the only—and may not be the most serious—threat to our smallest wild feline.

Bobcat hides keep high-society women—mostly in Europe—warm and fashionable. In the United States, wearing the fur of spotted cats—some of which are very rare—can result in a real tongue-lashing from a sentimental friend. Thus, fur coats aren't as *en vogue* as they are in Europe. They can also get the fur dealer in trouble with the law. Federal law prohibits importing spotted cats—i.e., leopard, ocelot, jaguar, etc.—into the United States.

In fact, it's the declining numbers and unavailability of many spotted cats that has really put pressure on the bobcat. And the problem is—our little wildcat apparently can't take the pressure.

Because of high demand for bobcat fur (called "lynx cat" by fur dealers), prices have soared to unprecedented heights. In the 1950s and early '60s, trappers received a mere $5-$10 for bobcat hides. This price jumped to about $20 in 1968 and to about $50 in 1973. By 1976, trappers cashed in prime pelts for $200-$300.

Obviously, such prices have tremendously increased interest in the bobcat. Because of easy access provided by an ever increasing number of new roads, trappers can reach further and further into what was once secure bobcat country.

graphics: Linda R. Stroh

A wily animal like the coyote might endure such pressure. But the bobcat, unlike the coyote, isn't very trap wise. Indeed, even the most inexperienced trapper can sometimes bring home $200 worth of bobcat with little effort. Coyotes, you may remember, withstood widespread campaigns to control their numbers. Instead of declining during this assault, however, the shrewd coyote enlarged its range and probably increased its numbers. Unfortunately, the bobcat probably can't follow this act.

The U.S. Fish and Wildlife Service keeps a list of predator control records. In addition, fur dealers keep records on bobcat sales. Both of these sets of statistics show the bobcat population going downhill faster than Jean Claude Killy. Although these figures most likely typify the trend, their exactness is still suspect.

This information gap is one of the big problems. Presently, no way exists to regulate or even determine the number of bobcats killed. Likewise, population trends can't be adequately estimated. But there's little doubt that bobcats are having problems.

For example, houndsmen and trappers heartily agree the bobcat is in real jeopardy. And they ought to know. They're the people who have been chasing the little critters all these years. But they haven't been getting much exercise lately. So they say the bobcat needs protection immediately.

This protection can come in several ways—some good, some bad. One good way is to take the bobcat off the predator list and make it a game animal. Then, the Fish and Game Commission can regulate the harvest and take the necessary steps. This would also enable game managers to begin collecting information about what's happening in the bobcat world.

Under the present predator status, almost anything goes, which apparently has been the case judging by how much trouble the bobcat is in. The 1975 legislature considered removing the bobcat from the predator list, but the bill failed. A

recycled paper

similar bill is making the rounds in the 1977 session. Hopefully, it will succeed.

If the bill fails, the bobcat might obtain some protection in a bad way—by inclusion under the U.S. Endangered Species Act of 1973. This federal intervention—and the tremendous controversy that almost automatically goes with it—isn't necessary. Bobcat management can be handled at the state level. Besides, the federal action may take too long.

It's much better to make the bobcat a game animal. We can control the harvest with regulations. We can avoid costly controversy. We can gather essential biological information. And most important, we can help guarantee a future for the bobcat.

Wambach Takes the Helm

On Dec. 27, 1976, Gov. Thomas L. Judge named Dr. Robert F. Wambach to replace Wesley R. Woodgerd as director of the Dept. of Fish and Game.

Wambach, 47, comes to the department from the University of Montana where he served as dean of the School of Forestry and director of the Montana Forest and Conservation Experiment Station. He also brings 25 years of experience in natural resource policy.

His mainstay, he feels, is "natural resource administration. And this is what the department really needs."

Wambach believes he can bring a different—and important—point of view to the department, namely more awareness of Montana's economic situation. "I consider myself an environmentalist," he explains. "But at the same time, it's vital to have a strong economy if we're going to protect the environment.

"With a strong economy, people are more interested in fish and wildlife," he notes. "When they're out of a job, they tend to forget about it.

"When preservation of an endangered species means human suffering, then that species is in real trouble," he explains. "So a strong economy can help that threatened animal.

"It's our job to protect and enhance the fish and wildlife resource, but it's unreasonable to think we can do this at the expense of other worthwhile causes."

Wambach worries about people thinking the fish and wildlife resource has been sold out because the governor appointed a forester to head the department—especially since the department has been at odds with the timber industry several times in past years. "I'm afraid some people see me as a timber beast," he says. "But I'm the furthest thing from that. I've often come out against the timber industry. The department isn't going down the tube because the governor appointed a forester as director.

"Wildlife doesn't exist in a vacuum," he reminds. "It lives in the forest, on the range, in the streams. So in many cases, proper management of land and water means proper management of wildlife habitat."

In addition, he pointed out that as dean of the forestry school, he administered the university's wildlife management program.

He admits he has much to learn. "However, the department is filled with professionals and I plan to listen to them," he said.

"I'm a very strong advocate of proper resource management, and I think this will become apparent during my tenure as fish and game director."

(For more of Wambach's views, see "The Director Speaks" on page 1.)

Robert F. Wambach

Some Sportsmen Do Their Share

Through the years, sportsmen's clubs throughout Montana have dedicated much hard work to various aspects of wildlife conservation and hunting. Some clubs become actively involved with legislation related to wildlife during each legislative session; some have provided public target ranges in their respective communities which are financed with member dollars and donated labor and materials, and others work constantly on solutions to the wide array of issues which today confront Montana's wildlife resource.

The efforts of one particular club, however, deserve special mention since the result has been definite dividends for wildlife—in this case, Canada geese.

In 1974, the Hill County Wildlife Assn. in Havre hit upon the idea of trying to improve nesting conditions for geese on some Hi-Line area reservoirs. With help from the Kremlin-Gildford vo-tech classes, farmers and ranchers in the area, Burlington Northern and Dept. of Fish and Game personnel, club members constructed more than 30 goose nesting platforms. The platforms—a workable alternative to islands, the preferred

nesting spots by geese—were placed on selected ponds and reservoirs on property owned by cooperating landowners.

The first year, about 20% of the platforms held nesting geese, and since, use of the structures by geese has increased each year. Both islands and platforms offer better security for nesting geese and apparently result in two to three times greater nesting success.

Four platforms on a large stock pond in northern Hill County were not used the first year. But in 1975, geese used two of the platforms and mallards nested on the other two. In 1976, geese apparently preferred the improved natural cover around the reservoir and only used one platform.

Two platforms set in a 1½-acre pond in 1974 have also been used each year, with two pairs using the platforms during each of the first two seasons. In 1976, two different pairs of geese used one platform, one after the other, and the other was claimed by a pair before the ice went out. These three pairs and four others nesting around the pond produced 39 goslings last year.

Some of the 54 nesting platforms put out since the project began have been lost due to ice movement and other factors. But in general, the project has been successful and a good example of what a club with interested members can accomplish through mutual effort and cooperation.

Many other such examples exist around the state—examples of sportsmen doing something for wildlife, instead of just talking about it. In the case of the Hill County Wildlife Assn., northern Montana geese now have an easier time finding a safe place to nest.

Update

More On Beaver Creek South

For about five months, Montana's wild animals lived under legal respite from uncontrolled encroachment of subdivisions on their habitat. A recent court ruling, however, has reestablished the principle that wildlife can essentially be ignored when assessing subdivision of prime habitat.

On Dec. 30, 1976, the Montana Supreme Court ruled the Montana Environmental Policy Act (MEPA) does not give the state authority to halt subdivision development on environmental grounds. The decision, which arose from an unusual rehearing by the high court, reversed the court's July 1976 ruling in the same case. That earlier ruling had mandated a thorough environmental impact statement (EIS) before any subdivision could proceed and had allowed legal action to halt further development if the EIS were inadequate. (See the Update, "Court Decision Better Than Expected," Nov./Dec. 1976 *Montana Outdoors.)*

The court case which brought the initial legal judgment and the subsequent reversal involved Beaver Creek South subdivision, situated in Gallatin Canyon, about 50 miles south of Bozeman. The subdivision borders on the Gallatin Game Range, a valuable elk winter range and important habitat for moose, deer and other wildlife.

The state Dept. of Health and Environmental Sciences received the subdivision proposal in spring 1974 and prepared an EIS, as required by MEPA. The Montana Wilderness Assn. and the Gallatin Sportsmen's Assn. sued the health department, claiming the EIS inadequately assessed the subdivision's environmental impacts in several areas, including effect on wildlife. The groups demanded an injunction halting further development of Beaver Creek South.

On Aug. 29, 1975, District Judge Gordon R. Bennett ruled in favor of the plaintiffs, terming the health department's impact statement "wholly inadequate." Judge Bennett's decision was subsequently reaffirmed by the Montana Supreme Court last July 22. In an opinion written by Assoc. Justice Frank I. Haswell, the court noted that Montana's Constitution endows citizens with "an inalienable . . . right to a clean and healthful environment." The court said all state agencies must follow MEPA guidelines, i.e., they must prepare a detailed, thoroughly researched EIS, which includes analysis of the impact on wildlife, before approving any major action. Because the health department failed to comply with MEPA guidelines, the injunction against Beaver Creek South was sustained.

The Supreme Court's July decision in the Beaver Creek South case was hailed as a landmark by conservationists in Montana. The decision was the first court test of MEPA and it indicated Montana citizens had a legal remedy to prevent adverse impacts of development on wildlife and other environmental values. The Supreme Court upheld three main issues: (1) the right of citizens to sue, (2) the right of citizens to seek an injunction to halt degradation of the area and (3) the responsibility of the health department to study and consider all environmental impacts of a development, not just those relating to sanitation.

In December 1976, the Supreme Court, at the request of the developer, Beaver Creek South, Inc., granted a rehearing of the case. Because of this rehearing, the court changed its decision.

By a 3-2 vote, the court said the Dept. of Health and Environmental Sciences has no control over subdivisions beyond considerations of water supply, sewage and solid waste disposal. Other environmental impacts are under jurisdiction of local authorities, the court said. In addition, the court ruled that MEPA does not give the state the power to stop a subdivision on environmental grounds.

This new decision on the Beaver Creek South case completely erased the judgment handed down only five months earlier. Effects of the reversal on wildlife and other environmental values are significant. Any subdivision which meets sanitation restrictions and gains approval of local governments can be developed, no matter where it is or how adversely it affects wildlife. As Steve Perlmutter, attorney for the Environmental Quality Council says, "There is no longer any statewide review of the broader impacts of subdivision." Montana citizens are thus left without legal recourse to prevent subdivision of prime wildlife habitat. In addition, the court's previous

judgments, allowing citizens to sue to require an adequate EIS and to enjoin further development in the absence of such an EIS, were voided by the new ruling.

The high court never explained the reason the rehearing was granted. Nor did the court comment on accusations that it was ignoring its own rules of procedure by allowing a rehearing without new evidence or new law. The December ruling did not cite any previous cases to support it, even though most decisions, including the initial verdict in this case, are backed by extensive legal precedent. District Court Judge Arthur Martin, who sat in for Chief Justice James T. Harrison in both hearings, has not publicly commented on the reason he changed his vote, a vote which overturned the earlier decision. And the decision was released on the last day and last hour of a court which had two retiring members.

What are prospects for a reversal of the reversal?

Two new justices have taken their seats on the state Supreme Court since the last ruling and attorneys for the Montana Wilderness Assn. will attempt to reargue the legal issues relating to MEPA and subdivision regulation by the health department. Another subdivision case, also based on MEPA, is expected to reach the court in coming months. The court's next decision could reinforce its last word on MEPA or it could re-establish some of the principles which came out of the initial Beaver Creek South decision. On another front, the Environmental Quality Council staff is proposing legislative amendments to MEPA which, if passed, would strengthen the state's power to regulate subdivisions and other developments with adverse environmental impacts.

For now, Assoc. Justice Haswell summed up the situation in his dissenting opinion in the Beaver Creek South rehearing. Haswell said the court's reversal of its initial decision has "dealt a mortal blow to environmental protection in Montana."

A Haunting Reminder

•*In light of the Jan./Feb. 1977 issue's lengthy article on the problems of weed control with chemicals, we thought the following, adapted from* Conservation News, *would interest readers.*—Ed.

On July 10, 1976, in the little town of Seveso just north of Milan, Italy, a white cloud of smoke spewed from a chemical plant. Contained within that cloud were thousands of tiny, powdery crystals of TCDD (2,3,7,8, —tetrachlorodibenzopara-dioxin).

When the cloud had cleared, the villages of Seveso and Meda had been blanketed with two to three kilograms of one of the most highly toxic substances yet known, and the entire fate of the two towns remained in limbo. Now, several months later, their future is still precariously uncertain and will probably remain so for generations to come. A previously little known town, the word Seveso still echoes throughout the world as a haunting reminder of what can happen without proper assessment of man's activities.

TCDD is an accidental dioxin contaminant created in the manufacture of trichlorophenol, which is used to produce the herbicide, 2,4,5,-trichlorophenol (2,4,5-T) and bactericide, hexachlorophene. Only with great care can its formation be prevented. So when a reactor at the chemical plant became overheated, the resulting rapid pressure build-up forced its contents through a safety discharge valve directly into the atmosphere.

For days, residents of the area seemed uncertain of the fallout's impact. Health officials did little to warn townspeople not to eat produce from infected gardens. But when livestock and birds began to die by the thousands, leaves shriveled and fell from trees and villagers began to develop skin rashes, chloracne (a severe and persistent disease which can be caused by exposure to TCDD) and skin lesions, it became obvious that the disaster was far more serious. Some 284 acres was fenced off to avoid further contamination, with another 506 acres designated as a "zone of caution."

In all but one of the plants producing trichlorophenol, some serious accident involving the release of TCDD has occurred. The first reported accident occurred in 1949 in a Monsanto Chemical Co. plant in West Virginia. Unlike the Seveso accident, all of the other releases were confined *within* the plant. But in Seveso, for the first time, the release was spread throughout the countryside.

Little is known about the systemic toxicity of TCDD. It has been linked with liver function impairment and other physiological disturbances. In addition, cases of depression and memory disturbances have been reported after TCDD exposures. On test animals, TCDD has been implicated as a teratogen (a substance producing a malformed fetus). So strong are these findings that 150 women from the Seveso area who were in their first three months of pregnancy during the explosion, have applied for abortions. The National Cancer Institute is currently studying the possible carcinogenic properties of TCDD.

Perhaps the most appalling finding is the fact that little is really known about the long-term impacts of TCDD. It is *not* water soluble. Contamination occurs so readily that, in previous accidents, all exposed materials were encased in concrete vaults and buried beneath the earth or dumped into the oceans. But what about Seveso? How does one bury a town? Many crop fields, livestock populations and buildings have already been destroyed. Despite these actions, recent tests reveal that TCDD concentrations are still found as deeply as 25 cm. within the soil.

In the United States, use of both hexachlorophene and 2,4,5-T has been curtailed. But until 1969, the U.S. Dept. of Defense bought all U.S.-manufactured 2,4,5-T for use in Vietnam, where it was routinely applied as a defoliant. Today, although no longer permitted for domestic use or near water supplies, 2,4,5-T is still widely used for control of weeds and brush on range, forest, road and railway rights-of-way and other non-agricultural lands. The effects the herbicide itself might have on vegetation and wildlife which inhabit these areas remain to be seen; that will require further scrutiny.

The disaster at Seveso can hardly be considered a surprise. It is obvious from the track record of trichlorophenol production that an accident like the one which occurred in Seveso cannot be totally unexpected. By the very nature of the production process, such a release can happen anywhere and at any time. But what is surprising and even sickening is that a system can exist which ascribes greater benefit to production of a herbicide or a bactericide than to the cost of the demise of a town and the unforeseen damage yet to come. One must wonder how many more hazardous substances are produced under this distorted guise. It is sad to think the disaster at Seveso had to occur before such negative impacts were publicized and even considered. And even now there is no guarantee that such failure to account for the true costs of these substances will not happen again.

Wardens advise anglers on fishing regulations and perform many other vital tasks in a comprehensive wildlife management program. F&G photo: Tom Warren

Wildlife and Law Enforcement

by Mel Wojcik

The phone rang at department headquarters and the secretary recorded the information. One, or possibly two, illegal elk were reportedly killed southwest of Helena. The caller had pinpointed the location of the incident and left a phone number where he could be contacted.

The area where the possible violation happened was open to hunting of either-sex deer and antlered bull elk. The warden investigating the incident discovered two gut piles and some tracks, both animal and human. Examining the scene convinced the officer that a cow and calf elk had been killed by one man and later a second person came. The animals were then

dragged downhill and hung in a locked shed. So, wardens watched the shed to prevent the poacher from removing the elk and investigated who owned, leased or used the unoccupied cabins in the area.

Two days later, wardens had gathered enough information to name a prime suspect. The individual didn't return for the elk—which would have made the case easy—so wardens obtained a search warrant and seized the elk as evidence. The third day after the incident had been reported, the suspect was interrogated. After an hour of questioning, he confessed.

Two men were ultimately convicted of the violations and fined $850. This was a "good case" in warden terminology, a case that makes a warden feel he did his job in prosecuting a flagrant game violation.

Similar cases occur each year throughout Montana. However, most fish and game violations aren't quite so flagrant.

"Law enforcement alone is not the entire answer to wildlife preservation," William F. Sigler wrote in his book, "Wildlife Law Enforcement." "Indeed, it is obvious that the best wildlife law enforcement agency, operating under ideal conditions, cannot produce fish and game in a desert. On the other hand, the best habitat cannot produce good hunting, fishing or trapping without adequate regulation and enforcement."

According to William B. Morse, field representative for the Wildlife Management Institute in Portland, Ore., management of fish and wildlife in the United States involves three fundamental activities: research, management and law enforcement. Information and education augment all three.

In most agencies, research—studying the relationship between wildlife and its habitat—should receive primary professional emphasis. Management implements research and helps maintain wildlife populations and provide for an annual sustained yield. Enforcement consists of the effort to secure public compliance with the laws and regulations that management uses as tools.

Basically, all laws fall into two broad categories: (1) those which help manage wildlife and (2) those which insure public safety and welfare. Originally, almost all fish and game laws were designed to protect wildlife.

As the human population increased, so did the number of hunters, fishermen and other recreationists. Before long, new laws—setting bag limits, requiring licenses, limiting the number of permits in a particular area and establishing the methods by which game and fish could be taken—were needed to help provide equal recreational opportunity for everyone.

As time progressed, additional laws to control the activities of hunters, fishermen and other recreationists became necessary. These kinds of laws included those prohibiting hunting while under the influence of liquor or drugs; prohibiting shooting from, upon or across a public road; requiring landowner permission for hunting; laws against littering; prohibiting certain methods of taking game or fish such as with poisons or explosives, and the unlawful use of a motor vehicle in hunting.

Fish and wildlife in Montana belong to the state and, therefore, to the people. The Fish and Game Commission supervises "all the wildlife, fish, game, game and nongame birds, and waterfowl, and the game and fur-bearing animals of the state."

The Enforcement Division of the department enforces all fish and game laws, as well as those pertaining to boat and snowmobile safety and park regulations. Duties of the game warden fall into three main categories: (1) law enforcement, (2) wildlife management and (3) public relations. The amount of time spent on each category varies with the season and locality. In Montana, about 50% of a warden's duties involve enforcement. The remainder of his time is spent monitoring license agents; inspecting private and commercial fish ponds, game farms and taxidermists; trapping and transplanting nuisance animals, collecting biological specimens, attending sportsmen's meetings and participating in hunter safety programs—to name a few.

Many times, the public looks upon enforcement as a necessary evil. However, an adequate law enforcement program is necessary to implement research and management.

Why do recreationists disobey fish and game laws in the first place? Some violations are committed because recreationists are not aware of the laws, or don't understand them. Others have little regard for game laws, as long as they avoid getting caught. Some may cheat just a little bit, and others scrupulously abide by the rules.

Some violations can be prevented. Others can't. As Sigler says in his book, "We need simpler laws and we need sound enforcement, but more than anything else, we need to teach the public to practice conservation and *respect* conservation laws" (emphasis added).

Common Violations-1975

fishing without license	611
possessing illegal game animal	164
hunting big game without landowner's permission	164
snowmobile registration or decal violation	161
making a false statement to obtain a resident license	151
tagging violations	147
operating a vessel with insufficient personal flotation devices	131
fishing with more than one line	123
fishing in closed waters	96

Wildlife belongs to the people of the state and the Dept. of Fish and Game is merely the regulating agency. Every time a person takes an overlimit of fish or bags an extra deer or opens a season early, that individual is stealing from every other sportsperson.

Enforcement requires consideration, thought, research and planning. Nationwide, it accounts for one-third of the personnel and over one-fourth of the budget of state wildlife agencies. In Montana, enforcement accounts for 33% of the permanent fish and game management personnel and the enforcement budget totals about 33% of hunting and fishing license fee collections.

Morse recommends keeping law enforcement strong, viable and modern by research, improved management and good recruiting and training. The objective of modern wildlife law enforcement is to protect fish and wildlife and their habitat from willful or negligent destruction by attaining an acceptable level of compliance to regulations and laws relating to fish, game, parks and recreation. The archaic law enforcement objective of "arrest all violators" isn't realistic. Nor is establishing a goal of 100% compliance with fish and game laws.

To illustrate, consider the point Herman Goldstein made in his paper, "The Ideal Versus the Real," when talking about police discretion: "Parking meters are a common source of irritation to both the public and the police. They were a particular source of annoyance to a city manager whose council membership included one man whose sole concern in life appeared to be those vehicles parked alongside meters on which time had expired. After reported criticism of the police department for its failure to achieve a greater degree of compliance and enforcement," Goldstein continued, "the city manager was moved to speak on the issue. He offered the councilman a choice from among what he referred to as levels of enforcement.

"He suggested that the city could assign one police officer to enforcing all of the meters throughout the city," Goldstein related in a speech delivered to a meeting of the National Institute of Police and Community Relations, conducted at Montana State University in 1963. "If this were done, he anticipated that the frequency of checks would be low and the number of overtime violations and red flags would increase. On the other hand, he could assign one police officer to each parking meter in the city. With such extensive coverage, there would be reasonable assurance that a summons would be issued the moment the meter expired. The city manager then suggested that the council determine through its appropriation just how many police officers were to be provided and what level of enforcement was desired as between the two extremes," Goldstein concluded.

On occasion, wardens help private landowners trap beaver which have dammed irrigation canals or otherwise caused problems. F&G photo: Tom Warren

The same holds true for wildlife law enforcement. It is said that about 95% of recreationists are conscientious. Only a small percentage ever causes any trouble. Just what is the truth about recreationists? How good or how bad are they?

In Montana, harvest figures and illegal big game kills—those that wardens find out about—can be compared. But without the unknown number of unapprehended violators, the overall picture isn't very clear.

A recent paper by George M. Dahl, chief of the Law Enforcement Division for the Michigan Dept. of Natural Resources, and Nemah G. Hussain, research superviser for Michigan's Law Enforcement Division, attempted to project the numbers of fish and game violations and trends in violations. By comparing user hours, degrees of compliance could also be measured. By plugging in variables, different items could be measured such as cost effectiveness of the enforcement program and enforcement effort effectiveness. The study showed a reliable figure representing the percentage of violators actually being apprehended. It was very low. For example, during the 1973-74 big game season, 2,763 violators were arrested. But the number of estimated violations was 181,183, meaning that about 1.53% of the violators was apprehended.

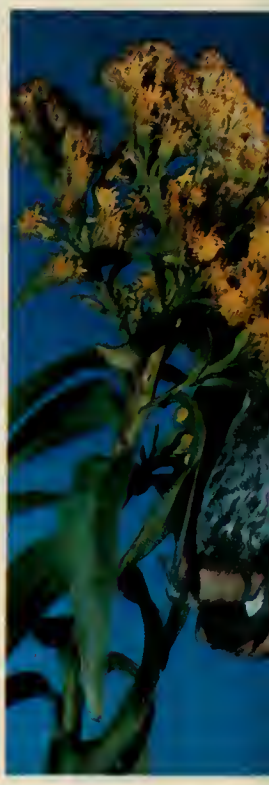
To date, a statewide evaluation of the wildlife law enforcement program has not been undertaken. The department's Planning Division has determined how much time game wardens spend on enforcement in comparison with other duties. However, studies to determine how well hunters and fishermen comply with game laws have not been conducted.

Wildlife law enforcement forms a large part of the department's total management program. To keep that program functioning properly, wildlife law enforcement must be kept strong, viable and modern by research, improved management and good recruiting and training. Part of the program management is evaluation. Law enforcement programs have not been successfully evaluated and depend on antiquated methods for program justification. Research into means of evaluation is needed and justifiable. ■

Bats Need Friends,

The silver-haired bat is often seen around woodland ponds at dusk. photo: Charles E. Mohr

The big brown bat forms maternity colonies in buildings. photo: Charles E. Mohr



The seldom seen hoary b Montana bats. photo: Ch

by Dennis Flath

Summer twilight on Montana's prairies and mountains brings an aura of sunset color. It marks the end of day and brings pleasant feelings of peace and contentment. It also marks the beginning of activity for many forms of Montana wildlife—those creatures known as crepuscular (twilight living) and nocturnal (night living). A casual glance at the half-lit summer sky often reveals silent, fluttering forms. Weaving among the trees or swooping over a grassy meadow or pond, one can often observe those creatures of the dark and half light: silent, mysterious bats.

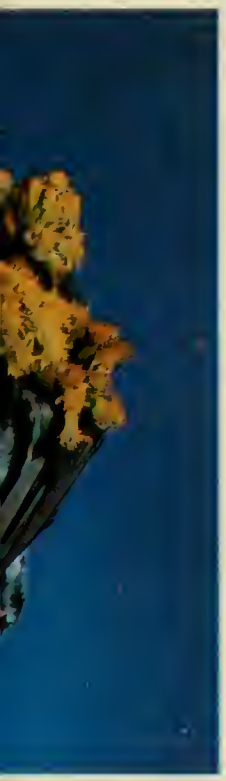
As mammals, bats possess characteristic features such as hair, milk glands, live birth and a muscular diaphragm. But a wing, formed by a double layer of skin stretched over the hand and arm, is distinctive.

A careful watch reveals a complex flight pattern—swoops, slips, stalls and occasionally a brief hovering. Bats are the only mammals truly capable of winged flight. And capable they are! In fact, few birds can rival the maneuverability of these expert fliers. They are aeronautic masters.

But the aerial abilities of bats extend far beyond what the human eye can see. Scientists, examining bat flight behavior with high speed photo equipment, have revealed many secrets of these sojourners of the night. The casual flick of a wing tip has purpose. A bat may actually reach out with its "fingers" and pluck a night-flying moth from the air. The moth is then transferred to the uropatagium (that portion of the flight membrane stretched between the hind legs), from which it is eaten. If the prey is large, the bat may alight momentarily to eat it. Smaller items are usually consumed while flying. Some bats consume their prey entirely, while others reject the head, wings and legs.

Often, bats actually capture fly-

Too



is the largest of all
s E. Mohr

The little brown myotis is a frequent resident of buildings. F&G photo: D. L. Flath
All photos, except the one above, courtesy of the Delaware Conservationist.

ing insects in the uropatagium. Simply bending the hind legs forward forms a convenient pouch which can be used to either scoop or hold prey. Flying insects are also caught in the mouth.

Twelve species of bats inhabit Montana. Each occupies a unique ecological niche which reduces competition among the various species for common resources. Some bats fly early in the evening, while others feed late at night. Some bats feed primarily on beetles, while others concentrate on the noctuid (night flying) moths. Thus, bat communities divide food resources so each species can forage in its own particular way without providing undue competition to other species. Scientists call this phenomenon "resource partitioning."

Worldwide, 791 species of bats exist. Some feed solely on fruit, others only drink blood and some even prey on other bats. The tropics harbor the greatest diversity of bat life, so Montana with its complement of 12 species can hardly be considered prime bat country. All of Montana's bats feed exclusively on insects (are said to be "insectivorous") and belong to the Family Vespertilionidae.

Among those abilities which bats have so admirably refined and developed, one stands out as exceptionally fantastic—echolocation (use of ultrasonic waves to "see" in the dark). Bundled up in the brain, nerves and ears of a bat is a radar system that, for accuracy and speed of translation, cannot be duplicated by any number of transistors and printed circuitry.

Even though bats seem silent as they fly through the gathering darkness, they are really "yelling" with all their might. But the sound produced by bats is inaudible to the human ear. Humans can hear sounds ranging from 20 hertz (Hz) to about 20,000 Hz (one Hz is one vibration per second). Most frequencies used by bats fall between 20,000 Hz and 130,000 Hz.

continued

Some detailed studies of echolocation, as used by foraging big brown bats (*Eptesicus fuscus*), have been described by D. W. Yalden and P. A. Morris in their excellent book, "The Lives of Bats" (Quadrangle/The New York Times Book Co.). When looking for an insect, the brown bat emits 4-5 ultrasonic pulses per second. Each pulse lasts for about 1/100th of a second and drops in frequency from about 60,000 Hz to 34,000 Hz. As the bat approaches the insect, the pulses become more rapid, lower in frequency and drop only 5,000 Hz from beginning to end. During the final phase of the capture, the bat emits about 200 pulses per second, with each pulse lasting a mere 1/1,000th of a second. Furthermore, frequencies within a pulse range from 25,000 Hz down to 20,000 Hz during the final moments before capture.

This system provides the bat with fairly general information while it is searching for the insect. Once an insect has been located, the bat needs more exact information. In essence, the bat "fine tunes" its radar which allows it to rapidly close in on the prey. The rapidity of the pulses during the last moments before capture allows precise tracking at that crucial moment just before contact—when accuracy is a must.

A bat can easily detect and zero in on a tiny gnat. The gnat is captured and consumed—not just one or two gnats per hour, but up to five hundred captures per hour. In laboratory work, the little brown myotis (*Myotis lucifugus*) has captured 1,200 fruit flies per hour.

This highly effective feeding mechanism allows bats to "fill up" in an hour or two. Many bats take a major foraging flight during the early part of the night, with a shorter foraging flight just before dawn. Between flights, some bats use a night roost, retreating to a more secretive and secure day roost before dawn.

Bats usually hang by their feet when roosting. The anatomy of a bat is so geared to flight that most bats (all Montana species) are almost helpless on the ground. A bat crawls very slowly and with great difficulty. The hanging posture when resting enables it to take flight by simply letting go and dropping into the air.

Bats roost in a variety of places. One usually thinks of bats as inhabiting belfries and caves. Indeed, bats are frequently encountered in such places. But they also use other sites. Almost any old, abandoned building is a potential roost, if not by day, then perhaps at night. Hollow trees, under loose rocks, behind loose

A Summary of Montana Bats

• big brown bat *(Eptesicus fuscus)*

A rather large bat with about a 13- to 14-inch wingspread. Fairly common throughout Montana. Buildings are preferred roosting sites. West of the Great Plains, generally produces one young per litter; east, produces two. Frequently emits an audible chatter while foraging.

• long-eared myotis *(Myotis evotis)*

Has the longest ears (22-25 mm) of any American *Myotis*. Wingspread about 10 ¾ inches. Has brown, glossy fur and nearly black wing membranes and ears. The long-eared myotis is uncommon, but it may be found statewide in timbered, mountainous terrain. Roosts behind loose bark and in cabins, but may use caves for a night roost. Flies in the late evening, foraging among trees and over woodland ponds. Winter range unknown.

• spotted bat *(Euderma maculatum)*

Rarest bat in Montana, only one specimen ever recorded. Easily recognized by its enormous ears and three white spots on its otherwise black fur—one spot on each shoulder, the third on the rump. Hardly anything known about the species' biology. Flies very late at night.

• silver-haired bat *(Lasionycteris noctivagans)*

A medium-sized bat with black, silver-tipped fur. Wingspread about 11-12 inches. Migratory, tree-roosting, fairly common statewide. Produces two young per litter. Characteristic of woodland ponds and streams, primarily in coniferous forests. It flies early in the evening and can be recognized by its slow and leisurely flight.

• hoary bat *(Lasiurus cinereus)*

With a wingspread of nearly 16 inches, the largest bat in Montana. Fur dark with frosted tips. The hoary bat is rather rare in Montana. A strong flier, it performs long seasonal migrations. Since hoary bats roost singly in foliage and fly late at night, they are seldom seen. Two young born in each litter.

• long-legged myotis *(Myotis volans)*

A good-sized *Myotis* with about a 10 ¼-inch wingspread. Color usually dark, but may vary from russet to nearly black. Underwing furred from the elbow to the knee. May be quite common in some areas, particularly at high elevations. It occurs throughout much of the state. It flies early in the evening and roosts in buildings and hollow trees. Forages in forest openings and over water. Winter range unknown.

bark or boards, and cracks and crevices in rocky cliffs are all places where bats might be found. Some bats hang in foliage during summer; these species are solitary and do not form the large groups common to other species.

The type of roost usually changes from summer to winter. In summer, bats need warm, moist places. In winter, hibernating bats must find a place sufficiently warm to keep them from expending too much energy to maintain minimal body temperature.

For this reason, caves are ideal. They provide a relatively stable environment that is dark and humid. The deeper one goes into a cave, the more constant the temperature. Thus, bats in a cave can select the range of temperatures that best suits them at any particular time of year—cooler, stable temperatures for hibernation and warmer, more variable temperatures for the maternity period. In addition, summer roosts must be cooler than outside temperatures and hibernating sites must not fall much below freezing in winter.

Bats live a long time, some 20 years or more. Their reproductive rate is correspondingly low and 10 of Montana's 12 species regularly have only 1 young in a litter. The other two species have two young. Bats have only one litter per year.

Baby bats are born late in spring when flying insects are plentiful enough to meet the nutritional needs of a lactating mother. For the first few days, the baby bat clings tightly to its mother's fur. Even on foraging flights, the newborn bat "hitchikes" along. It grows rapidly though, and by the time the baby is six or seven days old, the mother leaves it behind when foraging. In some species, mothers and babies have a specific bond and they recognize each other. In others, large maternity colonies are formed and a returning mother faces immense problems trying to locate her own young. In such situations, babies and mothers pair at random. In other words, the lactating mothers comprise a communal "dairy herd" for the host of growing young. By about four weeks, babies can scarcely be distinguished from adults.

The size of maternity colonies varies from only half a dozen bats to several million. However, Montana has no large colonies. A maternity colony of about 200 big-eared bats (*Plecotus townsendii*) may be seen at Lewis and Clark Caverns each year.

Males are usually absent from maternity colonies which (1) reduces confusion within the

• California myotis *(Myotis californicus)*

A very small *Myotis* with about a 9-inch wingspread. Color extremely variable, ranging from light tan to nearly black. This species is very rare in Montana, found only in the Bitterroot and Flathead valleys. Flies late in the evening, a bat of the western lowlands. Prefers man-made structures for roosting, but doesn't use the sites consistently. Winter range unknown.

• small-footed myotis *(Myotis leibii)*

Another very small *Myotis* with about a 9-inch wingspread and a tiny (8 mm) foot. Color highly variable, but usually yellowish or brassy. Membranes nearly black, as are the ears and "face mask." Can only be distinguished from the former by skull shape. Although not common, the small-footed myotis can be seen throughout much of the state. Habits and habitat in Montana poorly known, winter range unknown. Tolerant of cold.

• fringed myotis *(Myotis thysanodes)*

A rather large *Myotis* with an 11-inch wingspread. Ear length 16-20 mm. Color usually reddish brown, but may vary to dark brown. A conspicuous fringe of hair along the trailing edge of the uropatagium identifies this species. Extremely rare, it has only been captured a few times in southwestern Montana. Little is known of its habits or habitat in Montana. Presumably occupies dry forests. Winter range unknown.

• western big-eared bat *(Plecotus townsendii)*

Like the former species, characterized by enormous ears. Wingspread about 12 inches. A cave-dwelling species which, though not common, is fairly widespread in Montana. Flies late at night, although occasionally seen foraging at dusk. Its maternity roosts are quite sensitive to disturbance.

• little brown myotis *(Myotis lucifugus)*

A medium-sized *Myotis* with a 9- to 10-inch wingspread. Usually a medium glossy brown, but may vary to lighter or darker shades. Ears rather small (14-16 mm). A common species statewide, usually roosting in buildings. Winter range unknown. Flies early in the evening with a tendency to follow a set flight pattern. Only with great difficulty can the little brown myotis be distinguished from the Yuma myotis.

• yuma myotis *(Myotis yumanensis)*

Slightly smaller than the little brown myotis, with about a 9 ¼-inch wingspread. Color similar to the little brown myotis, but tends to be dull, not glossy. Ear length 14-15 mm. Fairly common within its range in western and south central Montana. True range in Montana poorly known, winter range unknown. It flies early in the evening, with a tendency to locate near open water. Roosts in a variety of situations.

colony, (2) reduces competition for food when the females need it most and (3) reduces competition for food when the newly weaned and inexperienced young start seeking it for themselves.

Both sexes inhabit hibernating sites. Before hibernation, breeding occurs. Bats don't spend much time with courtship rites and mating is promiscuous and unselective.

Even though mating occurs in fall or during occasional periods of wakefulness which punctuate winter hibernation, the females are not fertile at this time. They become fertile in spring after hibernation. The reproductive cycle thus includes a long period of sperm storage.

A discussion of bats would be incomplete without mentioning the possibility of rabies. Rabies is a painful and deadly disease infrequently detected in several species of Montana bats. So, don't handle bats or keep them for pets (as some youngsters are inclined to do). Any bat exhibiting strange or unusual behavior might be rabid. Don't touch bats lying on the ground or flitting about in daylight. It's unwise to handle even healthy bats—their sharp teeth inflict a painful bite.

Occasionally, bats become a nuisance when they take up residence in the attic of someone's home. They really do no harm, but may produce an unpleasant odor, especially on a hot day. The squeaking and shuffling could be embarrassing when one explains to guests that bats inhabit the belfry.

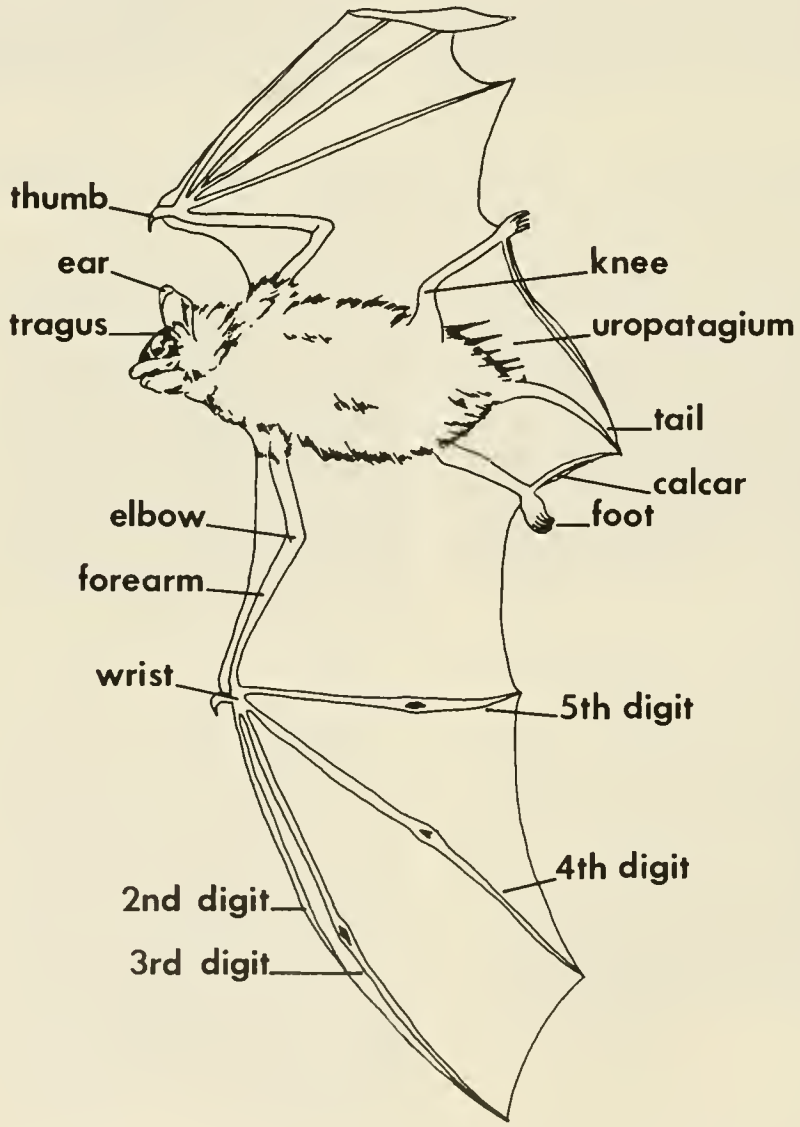
The logical solution might seem to be a call to the local fumigator. But such an action has several drawbacks. It may not be entirely effective; it may result in more bad smells if the carcasses are not removed, and it kills bats. The best way to eliminate them is to plug attic entrances while they are out foraging. This forces the bats to locate an alternate roost. Before such action, however, make sure no dependent young bats have been left behind. If you see young bats, wait until July or August when the whole family leaves for foraging flights.

Bats actually have few bad points—in fact, good points outweigh the bad. Remember, they eat tons of insects each year. Their ability to enter a dormant state—at will—may someday provide researchers a key to unlock the door to long distance space travel. Bats have already contributed to our understanding of radar and sonar.

In spite of their potential value to man, bats have been persecuted and associated with foreboding, sinister evil. In folklore, bats are linked to witches, werewolves and vampires—all because few people take the time or effort to understand the role these fascinating creatures play in nature.

Throughout the United States, bat populations have declined in recent years. Primary causes are widespread use of DDT and disturbance of roosts by cave explorers and researchers studying bats. Key natural roosting sites should be protected to maintain present bat populations. Today, most bat species in Montana are probably secure. Let's keep it that way. It's time to recognize that bats need friends, too. ■

Major External Features of the Bat



Dear F&G

Sweet Grass County Attorney Objects to Article

I recently read the Jan./Feb. 1977 *Montana Outdoors*. I was interested by an article in the Catchall called "Absaroka-Beartooth: Whose Right-of-way?" In this article, my name is mentioned several times and there appear several quotes attributed to me. I do not deny making any statements which appear therein, nor do I particularly mind having my name mentioned. What I do object to is the biased, uninformed and unprofessional job of researching the subject matter which went into preparation of the article. I notice the author's name does not appear on the article. I only hope this journalistic giant is presently applying his dubious talents to other endeavors.

The article deals with the claim of Park and Sweet Grass counties to a right-of-way through what is called the Slough Creek Corridor. The article is tempered in such a manner as to suggest your publication is the house organ of Friends of the Earth or the Sierra Club. The author has apparently fallen prey to the simplistic concept that everything is black and white; that "if you're not for us, you're against us"; or the classic, "the only good Indian is a dead Indian." This attitude has caused nothing but strife since the beginning of time. In this country, we had the same attitude exhibited in the 1950s. Everyone was either a commie or a true American, and we experienced the appalling McCarthy era. In the 1960s, everyone was either a hippie, draft dodger or a true patriot, and we had the divisive and traumatic effects of the Vietnam conflict. There was no middle ground. In the 1970s, the "era of social consciousness," everyone is either one of those who has sole responsibility for perpetuation of the planet Earth—the so-called environmentalists—or is a member of a group, made up of the rest of the population of the world, who is allegedly bent on the devastation of Mother Nature. I don't believe the issues have ever been, or ever will be, as simple as they have been made out to be in any of these instances.

For your publication to take the position that the counties herein are "pitted against" environmentalists perpetuates the type of destructive divisiveness referred to earlier. It implies that only environmentalists, whatever that term means, care about our natural resources and public lands, and that the counties favor total degradation of same. Nothing could be further from the truth. I would think that your publication, which I presume is supported to some degree by Montana tax dollars, would strive to present issues in a fair light. The article causes me to question the integrity of your magazine.

I would like to review the article with a view toward certain positions held by the counties. First of all, the counties have filed suit in Federal District Court to quiet title to a right-of-way which was established in 1893. At that time, it connected Cooke City with the Boulder Mining District, situated above the old mining town of Independence. Prior to that time, a road had been opened between Big Timber and Independence. Therefore, in the 1890s and thereafter, there was a continuous wagon road in existence between Cooke City and Big Timber.

The road was established in actuality by a road crew which chopped and graded portions of the route between Cooke City and the Boulder Mining District. They hauled a wagon with a 1,000-pound load over the entire route "without difficulty." These matters are verified by existent county records. Your article contains the statement that "between Wounded Man Creek and Lake Abundance only a seven-mile horse and foot trail exists with no evidence of any road or any indication where the road might have been." This statement is pure, unadulterated bunk. An inspection of the route reveals the following to those willing to accept reality: evidence of grading, trees and roots cut along the route, portions of the trail which were built up, wagon tracks, corduroy across bogs, old blaze marks, right-of-way indicators and even abandoned wagon parts. Of course, the route was never a developed road in the modern sense. But it was a serviceable wagon road at one time. Apparently, the author of your article failed to see any value in examining the route himself before writing his article. It would be interesting to know upon whose information he based his erroneous conclusions.

In 1974, the Forest Service (FS) sought to relieve itself of responsibility for certain road maintenance between Independence and Big Timber. At that time, extensive research was made of county records, both by the FS and the counties. It was clearly established, and the FS concurred, that an 1888 petition had created a road to the Hidden Treasure Mine in the Boulder Mining District above Independence. About this same time, or a short time before, the FS placed a gate across this right-of-way, a short distance above Independence. This action precipitated the dispute over the entire route between Independence and Cooke City. It was not because Evan White (your article erroneously identified him as Evans White) "stumbled across" an 81-year-old document.

In the fall of 1975, certain parties, unknown to me, presumably in protest of the counties' claims, cluttered the right-of-way with logs and rocks between the Slough Creek Divide and Wounded Man Creek. These were removed. In the summer and fall of 1976, this act of littering and cluttering the trail was repeated three times. Your article refers to "trees which had fallen over the jeep trail." This statement, again, is completely untrue. With limited exceptions, the only time anything fell on the trail was when logs and rocks fell from the hands of those who were vandalizing the trail. It will be noted, also, that some live trees were felled across the right-of-way. The vandals' obvious intent was to impede use of the trail by motor vehicles of any sort.

Prior to Aug. 29, we were informed there was to be an effort on the part of 4x4 enthusiasts and FS personnel to clear the trail. This idea had been discussed and abandoned, but there was still talk the trail would be

recycled paper

cleared. Sheriff Ken Thompson and I went to the area to take pictures and gather information to use in the lawsuit which was subsequently filed. We believed the trail would be cleared of debris by other people. This had not been done and to enable us to get further into the area to accomplish our purpose, we cleared the trail. Later, the trail was again strewn with debris on two occasions. FS attempts to discover who was persisting in creating this impediment to public use of the right-of-way were, predictably, unfruitful. The statement in your article that the trees were "quietly removed" implies that Sheriff Thompson and I surreptitiously cleared the trail of natural deadfall. Such was not the case and I resent the inference.

I find publication of an article consisting of so many groundless, unresearched conclusions to be quite alarming. This is particularly true when it is published by a state agency actively engaged in enhancing access to public lands. On the one hand, the Dept. of Fish and Game is spending hundreds of thousands of dollars of Montana tax money to purchase hunting and fishing access, is seeking to open roads to public lands and is encouraging out-of-state sportsmen to use Montana's public lands. On the other hand, the same department is supporting a "citizens' " wilderness proposal which, if adopted, will certainly restrict the amount and type of use of a vast area of public land. It seems your department is somewhat confused as to what the department envisions as its policy for future use of public lands. I personally can see merit both in wilderness classification and in the multiple-use concept for certain public lands. I do not here state a decided preference, although I realize the temper of this letter can be interpreted as being in favor of the latter. My purpose in writing is not as an advocate of that position. It is to protest publication of an article by a state agency which is so obviously biased and bereft of any in-depth consideration of the issues raised. This is too important an area of public concern to be treated in such a cavalier manner.

Your department is an administrative agency of the state of Montana. As such, it should make every effort to deal fairly with all citizens of this state. In establishing a management concept for a certain area, an effort should be made to determine what the people of Montana feel is the best course to take. This involves input from those most directly affected by the policy. In this case, you apparently chose to ignore the public opinion of the citizens of the counties involved. You chose to paint the officials of those counties as unthinking degraders of our environment without investigating what their attitudes and motives really are. Your article implies if the counties prevail in their suit and retain ownership of the right-of-way, the mountains will immediately fall down. It might be possible the counties would do a better job of acting to counteract any source of degradation than is presently being done. It will be noted that at present nothing, or very little, is being done to prevent erosion and other problems. Also, the area through which the right-of-way crosses is in a national forest. Regardless of whether the counties prevail, the vast surrounding area will be managed by the FS. How that area is managed, insofar as the counties are concerned, is not their responsibility. Perhaps your department might stop and consider some of these ideas.

When the author of the article called and spoke briefly with me, I offered several times to show him documents, photographs and legal memoranda which support the counties' claims in this matter. It was apparently too much bother for him to seek out all relevant facts. That offer remains open, although I am quite certain your publication is not interested in presenting both sides of this issue in a fair and unbiased manner. Even so, I'm sure there are many people among your subscribers who would like to hear both sides.

Thank you for your consideration of these matters.—*Kenneth R. Olson, Sweet Grass County Attorney; Big Timber, Mont.*

•Montana Outdoors *is not supported by tax dollars. The magazine is funded by the sale of hunting and fishing licenses.*—Ed.

First-Class Journal

This is just a brief message to congratulate you on the Sept./Oct. 1976 issue of *Montana Outdoors.* After reading several articles, I became aware of the excellent job this conservation vehicle accomplishes in your state. In my opinion, the publication is *far* superior to either the fish or game news offered in my home state of Pennsylvania. Your in-depth analysis of state conservation issues is first class. I also enjoyed the interesting concepts presented in the short notes concerning nongame species and conservation funding in other states.

Residents who enjoy the outdoors and care about the natural riches of Montana can be proud of your journal; it is possibly the finest state publication of the kind which I've ever seen (including New York's popular *Conservationist).—Barry Passmore; Warminster, Penn.*

Environmental Damage Against the Kootenai

I just finished reading an article entitled, "Return of a River," by Charles E. Brooks in *Trout* (Vol. 17, No. 2, Spring 1976). This article brought vividly to my mind a situation which, to an amateur fisherman such as myself, has caused quite a bit of consternation. I refer to the 12 months of open season on the Kootenai River. As you are well aware, this was one of Montana's outstanding trout streams and now the area below the dam affords excellent fishing for rainbow. However, my concern is that the fishing pressure extended over a 12-month period of time for local residents as well as many, many individuals who are flocking to the Kootenai River from many states throughout the nation, will reduce the amount of fish leading to the river and thereby reduce the excellent fishing. On page 21 of his article, Mr. Brooks says, "There is sufficient evidence to prove that 1,000 fishermen per mile of stream per day will not reduce the number of trout in the stream over a period of time *throughout* if no environmental damage is permitted."

A great deal of environmental damage has been committed against the Kootenai River by Libby Dam and many of us are deeply concerned about the future of this river and its aquatic habitat, fish and life on its banks. Now, there is the threat of further disaster to the Kootenai River by the desire of Northern Lights, Inc. to build a dam at Kootenai Falls. Many people in Montana are resolved that another dam will never be built on the Kootenai River and we are prepared to challenge any environmental impact statement which may be offered by Northern Lights. We are prepared to take any positive steps toward building a dam on the Kootenai River to court. Many environmental groups have resolved to do this at our meetings recently—The Environmental Defense Fund, Sierra Club, Friends of the Earth, Western

Montana Environmental Protection Assn., Northwest Citizens for Expanded Scotchman's Peak and Northwest Wilderness.

Information relative to the fishing pressures and the future of the Kootenai River would be greatly appreciated. I wish to compliment you on the excellent work you have done on the problems of the environment in Montana, with special reference to the Kootenai River.—*S. Thatcher Hubbard, Sr., M.D.; Spokane, Wash.*

For Future Reference

We wanted to let you know how much our family enjoys *Montana Outdoors*. Our children are too young to do much more than listen to some of the articles and learn from the beautiful pictures you present, but we save the magazines knowing that someday they will derive valuable knowledge from them.

Our commendation for your movie review, " 'Grizzly'—Don't Waste Your Money," and the article by Ken Walcheck, "Lewis and Clark Meet the Awesome White Bear" in the Sept./Oct. 1976 edition.—*Mr. and Mrs. Bob Wilson; Lewiston, Idaho*

Do Coyotes Prefer Rabbits or Deer?

I finished reading the Nov./Dec. 1976 issue of *Montana Outdoors* with much interest. The Catchall article, "Coyotes and Deer," really set me to thinking back to the past when deer were plentiful. I well remember back in the early '30s when deer were a very scarce commodity in nearly all parts of Montana. I also remember that rabbits of all kinds were plentiful nearly everywhere—that included jackrabbits, snowshoe hares and especially cottontails. There was also a lot of coyotes, but nobody ever heard of them killing anything as large as a deer. In the summer months, the country was also full of rockchucks and gophers of several kinds. Field mice populated every stubble field in the fall and winter because straw rows were left behind combines for cover.

The coyotes had plenty to eat with a minimum of effort. They could easily find what they liked best.

On one trip from Hardin to Billings, our kids counted the dead rabbits on the highway. That time they counted 106. Now one rarely sees a dead rabbit when driving from Hardin to Great Falls. The straw is mostly baled behind the combines and hauled off. Rockchucks and gophers, as well as prairie dogs, are very seldom seen any more.

Coyotes are not an easy animal to starve to death. If one kind of food runs out, they have the ability to learn to eat the next thing available. I strongly feel the coyote had to learn to kill deer, probably starting on cripples and developing a taste for venison, especially when that was the most available thing it could find. Deer were numerous and no doubt the coyotes were hungry.

I don't know what happened to the rabbits, but I believe if the rabbit population would build up, the coyotes would lay off the deer and no doubt would prefer rabbits.

Do you know of any areas where rabbits are still as plentiful as they were some 20 years ago? If so, are the coyotes also killing deer in those areas? Maybe something could be done to build up the rabbit population in order to help save our deer from the coyotes.—*Leo F. Kleffner; Hardin, Mont.*

Move the Dredges To Ennis Reservoir

I recently went back to my May/June 1976 issue of *Montana Outdoors* and noticed an article I had not read, "The Lower Madison—From Blue Ribbons to Inner Tubes?" It was very interesting and also quite disturbing.

As I read the article, the problem of lake depth and siltation brought to mind the project on the south end of Canyon Ferry where large dredges are building a series of islands and dikes for dust control and waterfowl habitat enrichment.

It seems to me this technique could be used to solve the problem posed in the article regarding Ennis Reservoir and the lower Madison River. Upon completion of the project at Canyon Ferry, the dredges could be moved to Ennis Reservoir to perform the same duties there. A series of islands and dikes could be built to enhance the

graphics. Vern Craig

waterfowl habitat in the area. Also, by building the dikes and islands, the reservoir would be deepened, cooling the water temperature and creating a better fisheries habitat in the reservoir as well as below the dam.

I realize I do not understand the scope of the engineering problems or the cost of such a project. However, I do not imagine they would be as great as those encountered at Canyon Ferry. I would further suggest this project could be funded through Dept. of Fish and Game license sales or grants from the U.S. Fish and Wildlife Service or the Bureau of Reclamation. I would presume Ducks Unlimited and other similar organizations would be more than happy to share in the work and expense of this project.

The idea of a lake south of the Madison plant with a series of islands and deep, interconnected channels and holes that would be able to provide shelter for a large supply of native waterfowl and rainbow and brown trout would be of value to all sportsmen. Depending on the extent of this project, perhaps it would be at least another 90—if not 100 or 200—years before the situation again became a problem.

Should the need arise, I would be more than happy to assist or spearhead a drive to secure support for a project like this. If this idea has merit or is already being considered, I would appreciate your viewpoints on the project.—*Jeff Nesset; Butte, Mont.*

Ruining Each Other's Environment

Something must be done about our northern neighbor's coal mining activities. The Canadians are presently—or are planning in the future—surface mining in areas which may be detrimental to Montana's environment. Cabin Creek and the Poplar River are the main two areas of concern. These waterways start in Canada and flow south into Montana. Pollutants and other strip mine by-products may severely alter the quality of the downstream waters.

It seems necessary to create international standards which would limit neighboring countries from ruining each other's environment.—*Ron Gessner; Bozeman, Mont.*

"Sportsperson" Means Much

In your Nov./Dec. 1976 issue of *Montana Outdoors*, you took time out to explain the license drawings for moose, goat, antelope, etc. permits. I found this article especially interesting since this year I was fortunate enough to draw a goat permit. Even more lucky, my husband did also. We have spent quite a bit of time hunting for goats, but have not been lucky as yet. However, we will continue to try—and this is the main reason I am writing to you. We are trying; we are hunting. If only one of us had a permit, we would still both be hunting because we enjoy it so much.

I wish to thank you for your recognition of the fact that many women do hunt, as well as men, by use of the word "sportsperson" instead of "sportsman" in the article mentioned above. I realize that it is only a small point, perhaps insignificant or even tiresome to many. But to me, its meaning is great. Thank you.

I congratulate you for a fine magazine, for its probing articles, excellent format and beautiful photography. It makes me proud to be a Montanan.—*Elizabeth B. Darr; East Glacier Park, Mont.*

Loggers Buy Licenses

I received the Nov./Dec. 1976 issue of *Montana Outdoors* today. I am fast getting the impression that instead of being a publication intended for all sportsmen, it has become a mouthpiece for the Sierra Club or other radical environmental groups.

Has it occurred to you that loggers buy licenses and tags (your wages) and pay taxes?—*Gerald Halley; Missoula, Mont.*

Contributors

Studies have shown from 40%-75% of adult female wood ducks trapped on the nest one year were retrapped in the same area the following year—some even in the same nest. After flying to wintering areas in the southern United States, about 50% of the adult pintails, gadwalls and shoveler females studied returned to nest in the same meadow, some within 50 yards of the nest used the preceding year. These are examples of homing, as **Dr. Robert Eng** explains in his article, "Going Home." It is an intriguing process by which animals return to the same seasonal ranges and it is turning out to be a valuable tool for wildlife managers. The article begins on page 2. Eng is professor of wildlife management at Montana State University, Bozeman, and has worked as a regional coordinator, head of wildlife research and biologist for the department. He earned a B.S. from South Dakota State University, Brookings; an M.S. from MSU, and the Ph.D. from the University of Minnesota, all in fish and wildlife management.

Once-productive grain fields that fail to produce crops. Certain areas in the farmer's field staying wet long after adjacent areas have dried. Salt concentrating in stock ponds or reservoirs. All are outward signs of "Saline Seep," a problem that is spreading over Montana's prime agricultural land. Unless trends can be reversed, 8 million acres could be affected. Control is complex and costly. But as **Mike Aderhold** points out, if efforts slacken, saline seeps will continue to spread and solutions will be more difficult to come by. Aderhold is the department's information officer for the Glasgow region. He holds a B.S. degree in zoology from the University of Michigan, Ann Arbor, and an M.S. in wildlife management from the University of Montana, Missoula. Turn to his article on page 7.

Many times, the public looks on enforcement of fish and game laws as a necessary evil. However, an adequate law enforcement program is necessary to implement research and management, as **Mel Wojcik** points out in his article on page 15. He also examines why recreationists disobey fish and game laws in the first place and points out that some violations can be prevented while others can't. His article, "Wildlife and Law Enforcement," includes a table enumerating the most common violations during 1975. A warden for the department, Wojcik formerly served as hunter safety coordinator. He holds a B.A. in zoology from UM and is secretary-treasurer of the Montana Wardens' Assn.

At dusk, a casual glance at the half-lit summer sky often reveals silent, fluttering forms. These mysterious creatures of the dark and half light—bats—are not at all the foreboding, sinister partners of witches and warlocks many people think them to be. Instead, man has yet to imitate their highly sophisticated radar systems. And, as **Dennis Flath** points out, they may contribute to long distance space travel efforts because they are able, at will, to enter a dormant state. Flath earned his B.S. in biology from Pacific Lutheran University in Tacoma, Wash., and his M.S. in wildlife biology from UM. He is the department's nongame species biologist. Find out why "Bats Need Friends, Too" by turning to page 18.

Placing American Wildlife Management In Perspective

Reprinted from a brochure published by the Wildlife Management Institute. Illustrations by Oscar Warbach

Writers and photographers have known for a long time that the plight of a wild animal struggling for survival makes a good story. Today, TV and illustrated magazines bring the problems of endangered species — sometimes with calculated shock effect — into the American home.

Much of this publicity has been constructive. It has aroused needed public support for efforts to save animals threatened with extinction at home and around the globe. Congress, as a result, has approved progressively stronger programs to aid wildlife species in difficulty. And the United States has taken leadership in developing a world treaty that commits all nations signing it to protect threatened and endangered animal populations.

As with all emotion-tinged issues, however, there is tendency to overstate the case. Some journalists distort the status of American wildlife in general, the steps needed to maintain wild populations, and the actions required to reverse declines of species that really are threatened. Because of such misinformation many interested persons get the impression that *all* American wildlife is endangered. This view is unsupported by facts.

That man and his works have destroyed a number of species and greatly reduced others that were abundant in early times is well-known. Less well-known is the fact that many species, some of which were rare in colonial times, are thriving today largely because of compatible human influences on the environment, well designed private management efforts, and sound state and federal wildlife management programs.

All wildlife is affected in one way or another by man. But man can build as well as destroy. Of all of the creatures on earth, he is the only one with the ability to tailor the abundance of most species to fit his desires. With some birds and mammals this can be done with minimum effort because human changes in the environment favor their increase or their needs are not as critical. With others deliberate and often expensive programs must be developed to maintain specific habitats. Actions needed to save one species may be entirely different from those needed to save a second. But all wild animals require adequate habitat to sustain their populations and breeding stock from one year to the next.

Food, water, and cover used to escape enemies and adverse weather are the essential parts of the habitat of every species. But the specific habitat needs of each species vary in some degree from those of every other kind of animal, although many different animals may occupy the same general area.

The water requirements of a desert jackrabbit obviously differ greatly from those of a beaver. What might be year-round food and cover for a meadow mouse would be little more than a full day's meal and no cover at all for an elk. Many migratory birds occupy and need widely different types of seasonal habitats separated by hundreds and often many thousands of miles. Some large mammals, like caribou and cougars, range over wide areas to find their year-round needs. Small animals, like shrews and moles, may live out their lives in one small corner of a field or woodlot.

Some species need a highly specialized type of habitat. Most woodpeckers require dead and dying trees to supply their insect foods and nesting sites. But the Gila woodpecker of the desert Southwest digs its nesting holes exclusively in the larger cacti.

Some species, like the California condor, can stand almost no human disturbance. Others, like the common pigeon and English or house sparrow, thrive in the most populous cities, nesting on buildings and garnering meals from human handouts and leftovers.

When the habitat needs of every species and subspecies are computed in detail, the range in variety is almost infinite.

Whenever local conditions change, the species composition of the local wildlife populations also changes. Some species may be eliminated, others decline, and still others increase. If changes remove any of its essential habitat requirements, a species cannot continue to live in the

area affected. If habitat of the kind it needs is reduced to remnants, the species will become endangered. If it is eliminated everywhere, the animals will become extinct. In the absence of adequate habitat, protection of individual animals is meaningless in terms of perpetuating wild populations.

Wildlife now threatened and endangered can be maintained only by protecting those populations that still exist and preserving what remains of their vital habitats. But their numbers can be increased by expanding and improving suitable habitats.

This does not mean that threatened and endangered wildlife can be saved only by denying or limiting human use of the land. Rather, it means that such use be done with thoughtful planning and with full consideration for wildlife's needs. Incorporation of such considerations in all programs affecting the landscape would assure a future for America's varied wildlife.

The potential for increase in wildlife populations in ideal habitat almost defies belief. In 1900, there were virtually no wild deer left in Pennsylvania. The state's original deer herd had been destroyed early in the 19th century by landclearing for agriculture, overgrazing, by destructive timber cutting followed by wild fire, and by unregulated shooting. After the Civil War, with increased industrialization and the opening of the West, thousands of farmers abandoned their marginal lands to move to towns, gold fields, or fertile soils beyond the Mississippi. Behind them, the forests, under protection from wild fire, gradually began to reoccupy abandoned fields and homesites, creating the early-growth forests favored by deer.

ALL WILDLIFE REQUIRE ADEQUATE HABITAT TO SUSTAIN POPULATIONS

Around the turn of the century, sportmen's organizations and the Pennsylvania Game Commission purchased a relatively few deer from other states and from private dealers, had laws passed to protect them, and released them into habitat that changing land use had made ideal for deer. Twenty-five years later, Penn's Woods held nearly a million whitetails, almost twice as many as the available range could support through winter.

Potentially, a deer population can more than double every second year. One doe can produce 15 or more fawns in an average life span of eight years. If all her young and theirs survive to the same age and breed as successfully, they would number 150 or more before her death. Many animals — songbirds, rabbits, squirrels, quail and ducks, for example — can increase at even greater rates.

Obviously, when a population of a particular species begins to multiply, something has to give — and it does. Each piece of land has a limit on the number of animals of any one species that it can support. Wildlife biologists call this carrying capacity. It is the capability of an area to provide a species' food, water, shelter, and other needs in a given season. Once carrying capacity is reached, the surplus animals must move elsewhere or die. If suitable under-stocked habitat is not available within their range of mobility, the surplus animals are doomed.

The tendency of populations of nearly all wild species is to expand rapidly to the carrying capacity of the available habitat. In some species, like pheasants and rabbits, which often produce ten or more young in a single breeding season, this level can be attained very quickly, even by a reduced breeding population. In other species, such as bears, which rarely breed until they are several years of age and then produce fewer young, the rate of increase is slower. But nature compensates by endowing the slower reproducers with longer lives.

For many species, particularly the smaller animals, nature's scheme is to produce an overabundance of young. This increases the likelihood that some will survive to perpetuate the species in spite of the inevitable toll taken by adverse weather, disease, starvation, predators, and other hazards. Most wild animals in North America produce all of their young during a restricted season of a few weeks, usually in the spring or early summer. In northern or temperate areas, summer carrying capacity is far

higher than that of winter because of the abundance of plant and other life. A relatively small patch of cover may contain a population of a dozen or more cottontail rabbits in early September, but few are likely to survive until March. No more than 35 percent of the young mourning doves produced in summer live until the next breeding season. The higher the reproductive rate of a species, the higher its natural mortality rate. In the wild, animals that produce many young have short lives and lose most of their young in their first year.

Nature has many methods for regulating wild populations. One of these is *territorialism* — the tendency of breeding animals to defend a given area. Some sea birds nest almost shoulder to shoulder in dense colonies, but they will not tolerate the presence of other birds within reach of their nests. The lilting song of a male house wren is not a song of joy, but a warning to all other wrens to keep away from his nesting territory. If an intruder ventures too near, the defending male will attack with righteous fury. A cock pheasant may gather a harem of six or more mates and defend a crowing area approaching an acre or more. A male grizzly bear, in breeding season, may defend 20 or more square miles from all other males of his kind.

Such natural population controls are nature's way of assuring that only the stronger, quicker, and more alert animals of each species survive until breeding season and perpetuate the species.

At times, a series of mild winters and unusually favorable conditions over several breeding seasons may temporarily raise the normal carrying capacity and the populations of animals that depend on plants. When weather conditions return to average, crowding leads to stress and competition for food, space, and mates and permits the spread of diseases. Winter food supplies become inadequate and malnutrition, diseases, and predators take heavy tolls. In turn, populations of wolves and other predators that feed on the plant eaters are regulated by the abundance or scarcity of the animals on which they feed.

Overpopulations can be especially disastrous to large browsing and grazing mammals, like deer and elk. Where overabundant, such animals can cause great damage to their own habitats, resulting in a much reduced carrying capacity for many years. That is what happened to the Pennsylvania deer herd in the late 1920's. Hundreds of thousands of deer died of starvation and disease in a series of bitter winters before the numbers could be lowered by regulated hunting to the carrying capacity of the winter range.

Even in some wildlife refuges and national parks, elk and deer herds must be thinned to prevent overabundant animals from destroying their food supplies and damaging the food supplies of other species. The lesson here is that man and his activities have so interrupted wildlife's natural cycles and systems in most places that only through deliberate management can mankind assure the survival of most species of wildlife.

Protection plays an important part in wildlife management. The best habitats are of no value to wildlife if there are no breeders to occupy them. But to argue that total protection is the answer for all wildlife problems is a dangerous oversimplification. It ignores the differing needs of the various species.

With the exception of a few species considered pests in certain situations, nearly all birds and mammals receive some degree of legal protection. Songbirds, eagles, hawks, egrets, and many other types of birds are granted continuing protection under state and federal laws. Most states provide full legal protection for endangered species found within their borders. At the federal level, the endangered species programs and the new world treaty governing trade in threatened and endangered species provide additional protection for our less common forms of wildlife. Violators of these laws risk heavy penalties in state and federal courts.

But the degree of protection needed by the different species varies as widely as their habitat requirements. The loss of only a few individuals

of an endangered species like the whooping crane or California condor would be critical. On the other hand, the coyote, in spite of persecution since early times, thrives in the face of adversity. It remains common on most of the western prairies and has extended its original range into the South and East.

Animals classed as game under state and federal laws may be hunted, but they are not without protection. They may be taken by hunters only under regulations that prescribe calendar dates, hunting hours, bag limits, and methods of taking. Under certain circumstances, hunting seasons for some game species may be closed completely. All game species are protected by law while they are nesting and raising their young. These regulations, based on careful research, are designed to assure the carry-over to the next breeding season of enough animals to repopulate the available habitat.

There are situations under which it may be necessary to reduce temporarily the population of one species to benefit another. Although gulls are protected by state and federal laws, legal protection of herring gulls nesting on islands off the Massachusetts coast was suspended for a while to permit the poisoning of some birds and destroying the eggs of others. The reason — the breeding gull population had mushroomed because of the presence of nearby mainland garbage dumps, and the abundant gulls were eating the eggs and young of the much rarer terns that formerly had the islands nearly to themselves.

NEARLY ALL BIRDS AND MAMMALS RECEIVE SOME DEGREE OF LEGAL PROTECTION.

In order to reestablish a species in suitable unoccupied habitat, it may be necessary to temporarily reduce the numbers of predators in the area until the released animals multiply and become familiar with their new surroundings. After prey species increase above the threshold level, predators are just one of the many factors bearing on the population's survival.

Predation is not all bad, in fact. By falling victim to a fox or an owl, for example, the prey helps perpetuate a higher and equally valued order of life.

Man rarely sets out deliberately to exterminate a wild species. Some, like the coyote and crow, that settlers marked for extermination, still thrive in spite of massive trapping and poisoning campaigns. But most of man's adverse influences on wildlife have been unintentional and inadvertent.

Man, his works, and his livestock compete with wild animals for food and space. Actually, the effects of habitat destruction are worse than direct killing, because unoccupied wildlife habitat can and, in time, usually will be reoccupied. Habitat that is drastically altered or destroyed can never support its original wild populations.

Housing developments, highways and airports, hydroelectric and irrigation reservoirs, factories, and mines contribute to the American standard of living. But each new residential or industrial expansion reduces the habitat base upon which many wildlife populations depend.

Even some practices associated with farming and forestry can adversely affect wild populations. Large mechanized farms devoted to single crops, like wheat, and extensive, closely planted pine plantations provide few of the needs of wildlife. Sanitation cuttings that remove all hollow, dead and dying trees and sprawling nut- and mast-producing hardwoods eliminate the dens, nest sites, and food of many forest species.

Draining and filling marshes, potholes, and other wetlands to expand croplands, commercial and industrial complexes, and transportation systems pose major threats to waterfowl and other wildlife. Coastal marshes, favorite sites for factories, refineries, and airports, are among the most productive types of habitats for a wide range of fish and aquatic wildlife. Channelization can destroy the habitat of animals frequenting rivers and streams.

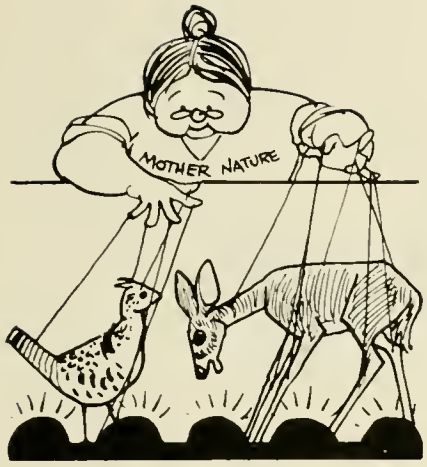
Livestock grazing can improve conditions for some wildlife, but overgrazing can exclude most wildlife use, often for many years. Large-

scale brush-clearing to favor grasses can eliminate food and cover needed by many birds and mammals.

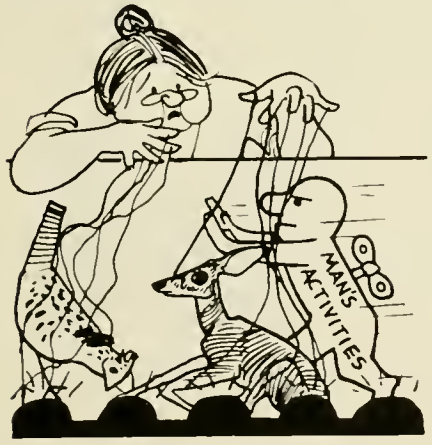
Modern technology has produced a broad range of pollutants with which wildlife must contend. Some, like certain pesticides and mercury, kill directly. Others, like DDT, operate more subtly on the animals' reproductive systems, cause eggshell thinning in some birds, and depress hatching success in others. Acid mine wastes and industrial pollutants destroy vegetation essential to the survival of many species.

Only through careful guidance of all human activities that affect wildlife, both indirectly and directly, can their populations be assured.

Sport hunting is recognized as a legitimate use of surplus wildlife by state and federal laws traceable in origin to the Magna Carta. These same laws establish the rights of the states to control the activities of hunters. Hunting is now regulated under comprehensive laws in every state. These are supplemented by federal laws applying to certain species, including migratory birds, and to the interstate shipment of wild animals and their products.



MAN AND HIS ACTIVITIES HAVE INTERRUPTED WILDLIFE'S NATURAL CYCLES AND SYSTEMS.



This was not always the case. Before the turn of the century, restrictions on shooters were few, and those laws that existed were poorly enforced, when enforced at all. In the early days, when the pioneer philosophy prevailed and many Americans lived off the land, nearly all edible or useful forms of wildlife were taken almost without restrictions at any time. "Useful" meant any bird or mammal that could be eaten or sold for its meat, feathers, fur, or other parts.

The brutalities historically attributed to hunters — the slaughter of the buffalo, the decimation of the sea otter, the extermination of the passenger pigeon, and others — involved mainly paid butchers who had no relationship at all with the modern sport hunter. The common use of bird plumage to decorate ladies' hats in the Gay Nineties and early 1900's nearly doomed the egrets and other plume-bearing birds before state and federal laws backed by firm enforcement checked their slaughter. Until comparatively recent times, any birds or mammals that eat meat — from sparrow hawks to grizzly bears — were considered enemies of the farmer or rancher and subject to killing on sight. Massive poisoning and trapping campaigns, largely by federal agents and professional hunters employed by livestock organizations, wiped out the prairie wolves and greatly reduced the numbers of cougars and bears. Now, these abuses, which were stimulated by economic concerns, have been substantially checked by a growing public appreciation of the many values of predators and of wildlife in general.

In recent times, demands for alligator hides by makers of shoes, wallets, and other leather goods, attracted poachers and illegal hide buyers to the swamps and bayous of the South. Their activities continue to be curbed by aggressive state law enforcement and by bringing the alligator under the protection of a long-standing federal law that prohibits interstate commerce in wildlife products taken in violation of state laws. Thus, state and federal conservation forces were united in correcting the problem.

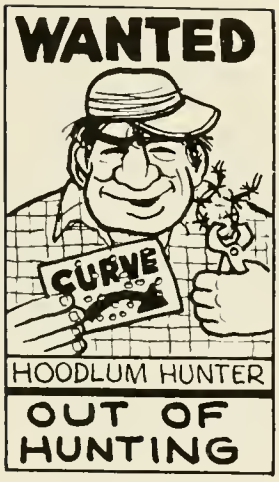
From the standpoint of wildlife conservation, hunting must be judged solely on its effect on the species of animals hunted. The fact that many designated game species have increased steadily in numbers over the years, in spite of growing numbers of hunters with greater mobility, testifies to the effectiveness of scientific wildlife management. It also shows that the carefully regulated modern hunter has no long-term negative effect on the comparatively few wildlife species he pursues. This conclusion is based on research in many regions of the country. Therefore, with properly regulated sport hunting having no adverse effects, the decision of whether to hunt or not to hunt is a matter of personal choice.

As with any large representative group of Americans, there are among hunters a minority who fail to abide by the laws and rules of sportsmanship. These people, when their activities are not checked by effective

law enforcement and the disapproval of the public — especially by sportsmen — can have undesirable impacts on local wildlife populations and create unfavorable reactions to hunting and hunters.

Regulated hunting, however, properly applied, is an important tool of wildlife management. The annual cropping of grazing and browsing animals whose populations are near carrying capacity lowers the annual loss from disease and malnutrition. It prevents the animals from becoming so numerous that they deplete their own food supplies and the food and cover upon which other species depend. Wild populations that are below carrying capacity are far healthier and produce more young than those at or near the capacity of the range.

Virtually all of this essential wildlife management is financed by funds obtained from sportsmen. By purchasing required federal duck stamps, waterfowl hunters annually contribute around $10 million to federal waterfowl and wetland conservation programs. Like any other citizens, of course, sportsmen also pay federal income taxes that support national wildlife and allied resource programs. But more important, their license fees and special taxes provide about a quarter of a billion dollars each year for the basic support of the state fish and wildlife conservation programs. Few state wildlife agencies receive funds from the general public.



Sportsmen also contribute to wildlife conservation through private organizations. Many local and state sportsmen's organizations have active cooperative programs that maintain and increase wild populations on private lands without cost to the public. Ducks Unlimited, an association of waterfowl hunters, has created or restored more than 1,000 Canadian waterfowl production areas covering more than 2 million acres. These critical wetlands provide habitat for more than 200 species of wildlife.

Sportsmen's state hunting and fishing license fees are used to buy, maintain, and improve wildlife habitat that benefits both hunted and unhunted wildlife on public and private lands and to provide the modern equipment needed to enforce laws for the protection of wildlife. They make it possible to employ many thousands of managers, biologists, and conservation officers to protect and care for wildlife. Many state wildlife agencies own or control large land holdings that are managed intensively to maintain wildlife populations at desirable levels.

Some critics of the American system of wildlife management have charged that because hunters and fishermen carry the financial burden of wildlife conservation, the state agencies favor game species in their programs and ignore nonhunted species. This overlooks the fact that many state wildlife agencies have excellent nongame wildlife programs. Habitat created or maintained for pheasants or quail additionally benefits a wide range of nonhunted species, from meadowlarks to hawks and owls. Most serious birdwatchers know that some of the best birding is found on state wildlife management areas and refuges. Waterfowl management areas provide food and cover for a host of nongame species, ranging from marsh wrens to ospreys and eagles.

While most state wildlife agencies would welcome financial support from the general public, state legislators have been reluctant to supplement fishing and hunting license revenues with general fund appropriations. In 1937, a federal law, the Federal Aid in Wildlife Restoration Act, was passed by Congress. It allocated to the state fish and wildlife agencies receipts from an existing 11 percent excise tax on sporting firearms and ammunition for the purpose of conducting approved projects of wildlife research, land acquisition and development, and restocking of unoccupied habitats. To qualify for this assistance the states had to pledge all hunting and fishing license funds to conservation purposes. Before that time it was common practice for state legislatures to divert income from hunting and fishing licenses for schools, highways, and other public works, while the state wildlife agency obtained only a part of the funds for actual use for fish and wildlife conservation.

Until state legislatures show more willingness to support wildlife programs with revenues from other sources, sportsmen will continue as the principal source of financial support for wildlife conservation. The reluctance of the general public and state legislatures to support necessary conservation programs overlooks the great social and economic benefits of sound wildlife management.

Individuals and groups interested in wildlife should bear in mind the animal's basic need for habitat. Secondly, they should seek to strengthen the state-federal system to assure the well-being of all wildlife. Distortion of the true facts with respect to America's wildlife only misleads the public. Further, it confuses lawmakers, who, in their efforts to respond to public concerns, sometimes resort to well-intentioned but ineffective remedies. The best thing that could happen to wildlife would be for all concerned Americans to join hands in working for truly needed programs. In this way, they would assure that adequate and effective steps are taken to restore depleted species and to prevent others from becoming endangered.

Forty known kinds of birds and mammals native to the United States and its territories have become extinct: 109 animals, of which 64 are birds and mammals, have been declared endangered by the Secretary of the Interior.

At face value these figures are alarming. But the situation in North America is not that bleak. Only six of the 32 extinct species and subspecies of birds were native to the North American mainland. Most were native to Hawaii.

Species and subspecies that have evolved in restricted island habitats are especially vulnerable. They depend for survival upon unique and fragile ecosystems that change dramatically with any intrusion of man. Evolution in isolation has equipped few island species to cope with introduced predators, such as house cats, rats and mongooses, or to resist introduced diseases.

Civilized man has brought wild and domesticated birds and mammals from his homeland to every island he has settled. Native animals usually are unable to compete with the more aggressive invaders. Grazing and foraging by sheep, cattle, goats and pigs often destroy vital wildlife habitats. Since its discovery, 40 percent of Hawaii's original forms of birds have become extinct, and another 40 percent are endangered, largely because of inadvertent human influences.

A large majority of the endangered animals and those that have become extinct were island species, literally or figuratively, in that their restricted habitats were surrounded by terrain unsuitable for their survival. Of the eight extinct North American mammals, two were meadow mice or voles. One was confined to a single small island in Long Island Sound; the other occupied an isolated marsh in California. The range of the heath hen was reduced to one island off the coast of Massachusetts soon after the American Revolution. In spite of 50 years of total protection, it became extinct in 1932. The population had been built to nearly 2,000 in the late 1920's when fire swept its nesting grounds at the height of the breeding season. Introduced poultry diseases eliminated the survivors.

Today, the heath hen's close relative, the Attwater's prairie chicken, occupies a similar vulnerable habitat on a small section of the Gulf Coast of Texas. The natural grasslands that it needs were much reduced and are now surrounded by cultivated lands and heavily grazed pastures.

Habitat factors even played a role in the fate of species that were destroyed or reduced to remnants principally by direct, deliberate killing. Commercial netting was a major cause of the extinction of the passenger pigeon. But the clearing of the northern hardwood forests for agriculture concentrated the nesting colonies and the activities of the netters. Steller's sea cow was butchered to extinction by Russian seal hunters before the American Revolution. The great auk, which became extinct in 1844, was slaughtered on its nesting grounds by whalers for its

eggs, plumage, and oil. All of these animals gathered in dense breeding colonies that made their killing easy. All were destroyed by unregulated commercialism long before there was more than rudimentary public sentiment for wildlife conservation.

The Badlands bighorn sheep, Merriam's elk, and eastern elk were decimated by meat-seeking settlers, prospectors, and market hunters before 1910. All occupied restricted and vulnerable habitats, and all suffered from competition with livestock and agriculture. State and federal wildlife agencies have introduced closely related subspecies of bighorn and elk to the original range of the first two animals. Most of the range of the eastern elk has been taken over by agriculture, but elk of closely related subspecies have been restored to Virginia and Michigan.

Modern sport hunting, as now regulated, has no relationship to the thoughtless commercial exploitation of wildlife of the past. The vast majority of the birds and mammals on the endangered list occupy highly specialized habitats. Some were not abundant even in early times. Kirtland's warbler, a tiny migratory bird that nests only in Michigan, must have jackpines between 5 and 18 feet high to nest successfully. Historically, this habitat was created by naturally occurring forest fires. But foresters in their efforts to develop commercial timber excluded fire from the woods and nearly eliminated the bird's breeding habitat. Today, wildlife managers and foresters are using prescribed burning in special refuge areas to maintain jackpines at their most attractive stage of growth for the warblers.

The ivory-billed woodpecker needs large areas of old-growth forests, with their dead and dying trees. Forests of this kind are disappearing because of the accelerating demand for agricultural and timber products. The black-footed ferret, never an abundant species, was unthinkingly reduced to an endangered status by the widespread poisoning of its primary prey, the prairie dog.

Most predatory birds and mammals have been persecuted for centuries because of their threat — real or imagined — to livestock, poultry, fish and game. Now, when predators are more widely appreciated, new threats have arisen to plague these interesting animals. Persistent pesticides, notably DDT and related substances, are absorbed from the water in the tissues of fish and other aquatic animals. As larger birds feed on fish and small animals low on the food chain, the contaminants concentrate in their tissues. The result is greatly reduced nesting success by larger fish-eating and predatory birds. The rapid decline of the bald eagle, peregrine falcon, and brown pelican is attributable primarily to pesticides.

Several species, like the ivory-billed woodpecker and Eskimo curlew, have been so reduced in numbers that there is little hope for their survival, if any still exist. But many animals now threatened or endangered could be restored to safe levels, if not abundance. This has already been demonstrated.

In 1935, trumpeter swans south of Canada were reduced to 73 on Red Rock Lakes and Yellowstone National Park in Montana. Since that year, when the Red Rock Lakes were declared a national wildlife refuge to protect the swans from irresponsible people and their habitat from intrusion, the population has responded well. Consequently, the trumpeter did not have to be included on the endangered species list. Other ancestral range in national parks and other western wildlife refuges support substantial breeding swan populations today. These resulted from the transplanting of surplus birds from the original refuge area.

The American alligator has increased rapidly in numbers under joint state and federal protection. Depleted habitat is now being repopulated with livetrapped and transplanted breeding stock. Federal and state authorities consider the alligator safe from extinction in most areas of the United States for the foreseeable future.

Many other species that are threatened or endangered today could be similarly restored through intensive management. The know-how al-

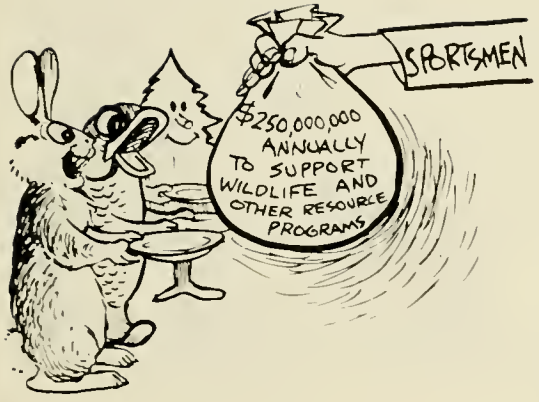
ready exists in the modern wildlife management profession. All that are needed are public and political support, time, and adequate funds to apply this knowledge.

The purpose of wildlife management is to maintain populations of wild animals at levels consistent with the best interests of wild species themselves and of the American public. Satisfying that objective is a big, complex job.

At the federal level, the U.S. Fish and Wildlife Service in the Department of the Interior is primarily responsible for regulating interstate and international traffic in wildlife and wildlife products and enforcing regulations applying to designated migratory birds. The Service administers the national wildlife refuge system, which provides protected and managed habitat for a wide range of wildlife species. It conducts research and maintains cooperative programs with state fish and wildlife agencies, private conservation groups, universities, and other federal land-management agencies.

The Service is funded primarily from the U.S. Treasury to the extent of around $90 million a year. It receives more than $10 million annually from Duck Stamp revenues that are applied primarily to the expansion and development of the national wildlife refuge system. Each waterfowl hunter, 16 years of age and over, must purchase a federal hunting stamp each year.

The U.S. Forest Service which controls 187 million acres of national forests, and the Bureau of Land Management which administers 465 million acres of public lands, and the Soil Conservation Service also employ staffs of wildlife specialists whose salaries are paid by congressional appropriations. Considering the vast acreages of wildlife habitat involved, the manpower and funds available have been inadequate to cope with the magnitude of the task.



Each of the 50 states has an agency responsible for managing and protecting wildlife. These agencies are financed almost exclusively by sales of licenses to hunters and anglers and by receipts from federal taxes on sporting arms and ammunition and fishing tackle allocated to them for approved fish and wildlife conservation projects. The combined annual budgets of the state agencies, from these sources and others, exceed a third of a billion dollars. Approximately, $250 million of this is derived from sportsmen.

Although program emphasis and organizations vary, the typical state agency contains a research branch that obtains facts on the status of various species of wildlife and develops techniques for management; a management branch that maintains, improves and develops habitat, and performs such tasks as livetrapping and transplanting surplus wildlife; a law enforcement branch, responsible for enforcing the laws and regulations applying to fish and wildlife; and a branch of public education and information.

The state, under common law rooted in the Magna Carta, owns and holds in trust for its people all of the wildlife within its borders. In the case of migratory birds, marine mammals, eagles, and some other species, prerogatives for protection have been assumed by the Federal Government through its treaty-making powers and special acts of Congress. Since state laws affecting these species usually parallel the federal laws, these species generally receive dual protection. Federal and state conservation officers cooperate closely in protecting wildlife.

State fish and wildlife agencies own or manage more than 50 million acres for wildlife production. These refuges and management areas provide the habitat needs of a wide range of birds and mammals, unhunted as well as hunted. State wildlife managers also work with landowners and with state and federal foresters and land managers to improve, restore and maintain wildlife habitat on private and public lands.

Application of management has restored some wildlife populations, and holds promise for helping more.

continued

Some Accomplishments of Modern Wildlife Management

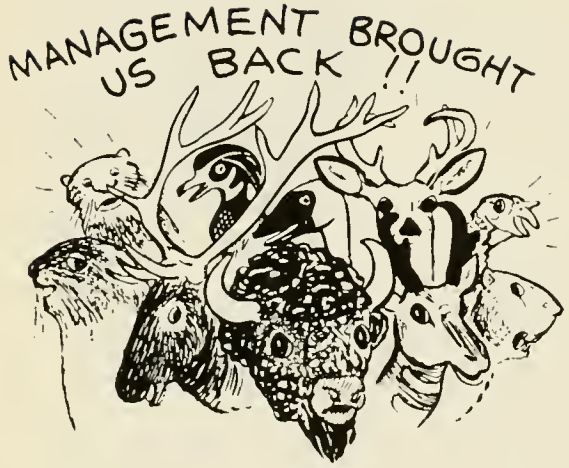
To appreciate the present, one must understand the past. Around 1900, most authorities did not have much hope for any of the larger forms of wildlife surviving far beyond the 1920's. This pessimistic view failed to foresee the scientific wildlife management programs that developed in the early 1930's and which have been expanded through subsequent decades. Here are a few historical comparisons:

- Beaver: *1900*—Eliminated from the states of the Mississippi Valley and all eastern states except Maine: common only in Alaska and a few localities in the Pacific Northwest and Rockies. *Today:* Common to abundant in nearly all states except Hawaii.

- Pronghorn Antelope: *1925*—Authorities estimated 13,000 to 26,000 in U.S.A., most in Wyoming and Montana. *Today:* Minimum population in all western states is 500,000.

- Bison: *1895*—800 survivors. *Today:* Population about 6,000 in U.S.A.; all available range fully stocked.

- Elk: *1907*—Common only in and around Yellowstone National Park; estimated total south of Canada, 41,000. *Today:* About 1 million in 16 states.



- White-tailed Deer: *1895*—About 350,000 south of Canada; extirpated from more than half the states. *Today:* Approximately 12 million in 48 states.

- Wild Turkey: *1930*—Common in only a few southern states, eliminated from most. *Today:* Restored to 43 states, including establishment in several outside original range of species.

- Fur Seal: *1911*—Official census in Pribilof Island showed 215,900. *Today:* Herd maintained at around 1.5 million under a scientific management program.

- Egrets and Herons: *1910*—Several species on the brink of extinction because of slaughter on their nesting grounds by feather collectors to supply the millinery trade. *Today:* Most species common to abundant over most of the United States.

- Trumpeter Swan: *1935*—73 survivors south of Canada on one wildlife refuge. *Today:* Thriving populations on two national parks and several national wildlife refuges. Removed from endangered status in the late 1960's.

- Wood Duck: *1915*—Greatly reduced in numbers and considered a candidate for early extinction. *Today:* The most common breeding waterfowl in eastern U.S.A.

- Sea Otter: *1907*—Nearly extinct; a few survivors in Alaska's Aleutian chain and in coastal California. *Today:* Minimum of 50,000; successfully restored to waters of mainland Alaska, Oregon, Washington, and British Columbia, increasing and extending range in California.

Since 1938, state fish and wildlife agencies have used sportsmen's license fees and special taxes under the Federal Aid in Fish and Wildlife Restoration Acts to:

- Acquire, develop, or manage 2,900 wildlife refuges and management areas totalling nearly 40 million acres. These lands protect vital habitat of a wide range of wildlife and are heavily used by bird watchers, nature students, and other outdoor enthusiasts.

- Construct or restore more than 300 lakes for fish and wildlife with a total surface acreage of 35,000.

- Assist hundreds of thousands of landowners with wildlife habitat improvement projects.

• Acquire or develop more than 3,000 public access areas that open nearly a million otherwise inaccessible acres and 2,000 miles of stream to outdoor recreational use.

• Livetrap and transplant to unoccupied habitat more than 50,000 deer, 16,000 antelope, 2,000 elk, 1,000 mountain sheep, 18,000 fur animals, 20,000 wild turkeys, 22,000 waterfowl, and 130,000 quail.

• Conduct extensive research on wildlife habitat needs, diseases, population trends, predator-prey relationships, and wildlife crop-damage abatement.

• Conduct public conservation education programs for school teachers and students and promote understanding of wildlife needs and habits through articles and television shows.

• Protect both hunted and nonhunted wildlife by apprehending conservation law violators. Many state conservation law enforcement officers also enforce laws against polluters, whose activities impose serious threats to wildlife and its habitats.

What You Can Do

There are many steps the concerned citizen can take to assure the future of America's wildlife.

Those who own land, whether suburban lot, woodlot, farm or ranch, can make improvements that will attract and hold wildlife, often at minimum expense. Your state wildlife agency has publications outlining such improvements. Many state agencies provide on-the-ground technical assistance and inexpensive wildlife food and cover planting stock within the limitations of budget and manpower. Additional information and assistance are available from the Extension Service, U.S. Department of Agriculture, at your state university.

Those who do not own land directly are shareholders in the largest landholdings in the United States. These are the 725 million acres of national forests, parks, wildlife refuges, public domain, and other lands held in trust for the American public by the Federal Government. Even on the national wildlife refuges, program funding has not kept pace with demand. As a citizen shareholder you can insist that Congress and the Administration provide adequate funds to maintain balanced uses of resources and wildlife populations on all public lands.

Additionally, all citizens can help wildlife if they:

• Support federal, state, and local efforts to develop land-use planning programs that protect vital wildlife habitat from unnecessary and haphazard development.

• Urge public officials to consider wildlife in all programs affecting land and water developments.

• Insist that agriculture, flood-control, and other publicly subsidized government programs yield broad public benefits in the form of wildlife enhancement.

• Realize that wetlands are not wastelands but essential units of the landscape that have important ecological functions of economic and cultural importance to man.

• Reject simplistic panaceas for maintaining and restoring wildlife based on unscientific emotion.

The perpetuation of wildlife requires the attention of well-trained and experienced specialists. Each state now has a staff of such scientists. See that they have the public support and funds needed to carry out their work in a climate free from political meddling.

America can retain and expand its rich wildlife heritage if it applies scientifically sound facts to the management of all wild species and if its citizens harmonize their activities with the systems of nature. ■

WE ALL NEED CLEAN WATER

NATIONAL WILDLIFE WEEK • MARCH 20-26 1977